USAID SPONSORED TRAINING PROGRAMME ON PLANNING, IMPLEMENTATION AND EVALUATION OF AGRICULTURAL PROJECTS
(APRIL 20 - MAY 15, 1987)

PROGRAMME DIRECTOR
SMT. S. SAROJA

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INDRAPRASTHA ESTATE, RING ROAD, NEW DELHI.

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PREFACE

The purpose of this book is simply to sharpen the decision analysis tools of those involved in agricultural projects. It discusses practical ways to ensure economic and efficient use of scarce resources. The book is not a treatise on agriculture.

The economic theory underlying project analysis is quite simple. The analytical tools introduced here are not complicated, but they are effective. They are commonly used by banking institutions (including the World Bank), for economic analysis underlying a large number of investment decisions every year.

This book is a compilation of papers and case studies presented at the USAID sponsored training programme on "Planning, Implementation and Evaluation of Agriculture Projects, conducted at IIPA in collaboration with the Ministry of Agriculture, Government of India from April 20 to May 15, 1987.

My thanks are due to USAID and Ministry of Agriculture for providing the financial support needed for bringing out this book. I am also grateful to IIPA and the Corporate Studies Group in particular for their help in printing this book.

I hope this book will be useful for personnel dealing with planning, implementation and evaluation of agricultural projects, and for training programmes on the subjects.

IIPA
New Delhi - 110002
1st March, 1988

S. Saroja.
(S. SAROJA)
Programme Director

C O N T E N T S

AGRICULTURAL PROJECT PLANNING AND IMPLEMENTATION

1. INTRODUCTION

The projects in the agricultural sector in India are large and constitute a sizeable part of public and private investment because of their magnitude and coverage. Still the importance of systematic agricultural project planing and implementation has not been fully realised. Project planning often operates on an adhoc and piecemeal basis. Agricultural projects are often designed in a hurry without fully verifying their viability, resulting in avoidable waste of resources and delays.

The central place which the agricultural sector enjoys in the overall development of our economy is a widely recognised fact. The pattern of agriculture varies due to differences in climatic conditions not only from one state to another but also from one region to another within one state. Therefore, one has to properly identify agricultural and rural development projects with relevance to local factors. Agricultural and rural development projects also have priority in the lending programmes of national and international financial institutions. New projects are being initiated by which agricultural development objectives are being translated into investment and action programmes. In order to achieve optimum gains from any project it is essential to properly identify and formulate the project before implementation. The skills needed to identify, prepare and analyse projects are still inadequate in this sector. Much more attention has been paid to broad based policy formulation and planning while specific microlevel formulation of projects has received less attention. The role of training to improve the capabilities of personnel employed in agricultural project administration is very crucial.

The training programme on "Planning Implementation and Evaluation of Agricultural Projects" was sponsored by the USAID in collaboration with the Ministry of Agriculture, Government of India to fulfil this need. The training programme was organised by the Indian Institute of Public Administration, New Delhi at the Institute from April 20 to May 15, 1987. Such a course is an essential requirement for officials who are responsible for project planning and implementation particularly those involved in micro-planning.

2. OBJECTIVES OF THE PROGRAMME

The main objective of the training course was to strengthen the capability of the participants with reference to various aspects of agricultural projects. The modern techniques and methodologies which are applicable to various stages of the project cycle were included in the training course. The whole course was directed towards providing a comprehensive prespective on

(i) Project identification and formulation;

(ii) Project appraisal; and

(iii) Implementation and evaluation.

Thus the course sets the stage for studying project formulation and management within the agricultural development process. The course emphasizes the following participant learning objectives:

(i) to clarify and appreciate the importance of proper identification of agricultural projects;

(ii) to recognise the importance of formulating agricultural projects with a deeper awareness of the costs and benefits involved;

(iii) to appraise the project with reference to its technical, economic and financial viability and analyse its contribution towards programme objectives relating to agricultural development;

(iv) to be able to understand the principles and practices of project organisation and management and their use in actual implementation of the programme; and

(v) to develop competence required for effective and efficient administration of agricultural projects.

3. PROGRAMME DESIGN

The major emphasis was on the issues relating to agricultural project identification and preparation, technical parametres, aspects of project appraisal and implementation as the course aimed at developing the skills and capabilities of personnel with reference to these aspects.

In the first phase, there were theoretical sessions in which the faculty members and other guest professionals discussed the various aspects of agricultural project planning and preparation. There were also group discussions by participants in which they shared their experiences in this field. These discussions increased the participant's involvement in the programme and the group's cohesiveness to go for field work.

In the second phase, participants visited various agricultural project areas in order to develop practical understanding and to get a cutting-edge knowledge of project operational situations. They were divided into groups and were encouraged to discuss with project

ersonnel and beneficiaries to understand and analyse the causes for hortfalls, delays in procurement cost, overruns, time overruns etc.

All participants visited the "Himachal Apple Processing Project" Agro-processing) and discussed with officials, and saw practical emonstrations of packaging, processing of juice etc. Then the articipants were divided into three groups to visit three different rojects. The first group visited 'Inland fisheries project' in Bardwan istrict of West Bengal, and the second visited 'Soyabean oil Processing nit' at Sehore in Madhya Pradesh. The third group went to Lucknow to ee the project on 'Reclamation of Saline and Alkali Soils in Uttar radesh'.

In the third phase, the participants prepared reports about their isits to project site and presented them for discussion where nteraction with faculty members and senior professionals proved ruitful.

. **COURSE CONTENTS**

(i) Project Identification and Preparation

Definition of project - identification - Project formats - Project cycle - Aspects of project preparation and appraisal - Costs and benefits - Secondary costs and benefits - Intangibles - Problems of project design and Implementation.

(ii) Investment Analysis

Time value of money - Mathematical formulations of discounted measures and annuity - Net Present Value - Internal Rate of Return - Benefit Cost Ratio - Net Benefit Investment Ratio - Selecting among project alternatives - Choosing among mutually exclusive alternatives - Sensitivity analysis - risk and uncertainty - Switching Values.

(iii) Technical Aspects of Agricultural Projects

Technical parametres - soil conditions - climatic effects - input coefficients - output parametres - effects of changes in input coefficients on output.

(iv) Financial and Economic Analysis of Projects

Identify project costs and benefits - Pricing project costs and benefits - Predicting future values - Computing NPV, and IRR - Benefit cost Ratio - Net Benefit Increase - Determine economic value - Determine the premium on foreign exchange - Adjust financial prices to Economic values - Value of intangibles - Social costs and benefits.

(v) Farm Investment Analysis

Farm resource use - Farm inputs and outputs - Farm budgets - Net Benefit increase - incremental cash flows - Computing Debt Service - interest rates - repayment schedules

(vi) Project Management

Introduction - Function, process and time relationships - Project Stages - Communication and time management - Machinery and input management - Quality - Scope - Human resources management - Cost management - Work breakdown structure - Work packages.

(vii) Project Organisation

Functional organization - Projectized organisation - Matrix organisation - Coordination - Selecting the organisational form - The project office - Project team - Project organisational chart - Leadership qualities.

(viii) Project Monitoring and Control

Project planning and scheduling - Programme Planning - Importance and need for monitoring - Information system for monitoring and control - Program Evaluation and Review Technique - Critical Path Method - Time and Cost control - Variance analysis - Reporting - Rescheduling and Replanning.

(ix) Data base for Agricultural Projects

Data requirements for project formulation - Technical data - Collection of data on input and output parametres - Trend data on prices and costs for measuring the value of benefits and costs - Time series - Data for monitoring and control - Feedback.

COURSE READING MATERIALS

Reading materials were prepared on various aspects of project analysis to be distributed to participants. Also background papers on specific agricultural projects were supplied to the participants. The training materials published in this book include all the background materials prepared by IIPA faculty and guest faculty.

We are also grateful to Dr. J. Price Gittinger who promptly accepted our request for training materials from the Economic Development Institute with reference to "Agricultural Projects". We appreciate his kind gesture. We are also thankful to Ms. Edith A. PENA, Studies unit, EDI, World Bank for sending the relevant training materials in time. Copies of these materials were also given to the participants.

some of the case exercises from the EDI materials were also used during practical sessions.

Participants were also supplied with the following text books to supplement the above training materials.

1. Project management - A Systems approach - Howld Kerzner.

2. Cost benefit analysis - A.K. Das Gupta and D.W. Pearce

3. Projects - Preparation, appraisal, budgeting and Implementation Prasanna Chandra.

4. Guidelines for project evaluation - UNIDO.

5. Guide to Practical Project appraisal - UNIDO.

The use of Scientific Calculator in project analysis was also demonstrated and each participant was given a scientific calculator.

5. LIST OF PARTICIPANTS

1. Shri V.G. Balar
   Dy. Director of Agriculture (Sociology)
   Directorate of Agriculture,
   Gujarat State, Krishi Bhawan,
   AHMEDABAD - 380006
   Off: 7771-4/Ext. 6

2. Shri C.V. Naik
   Principal Agril. Officer
   BELLARY (KARNATAKA)
   Off: 3423, Res: 2364

3. Shri Kanwal Kumar Narang
   Asst. Economics & Statistics Adviser (FE)
   Directorate of Economics & Statistics,
   Deptt. of Agriculture & Cooperation,
   Ministry of Agriculture,
   Krishi Bhawan,
   NEW DELHI - 110001
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4. Shri K.J. Nandeshwar
   Dy. Director of Agril. (L.D.)
   Konkan Division,
   16, Wagle Estate,
   THANE - 4 (MAHARASHTRA STATE)
   Off: 594407

5. Shri R.K. Odedra
   Deputy Director of Agriculture (Input)
   Rajkot Division
   RAJKOT (GUJARAT STATE)
   Off: 43016

6. Shri R.N. Prasad
   Extension Officer
   Directorate of Extension,
   Ministry of Agriculture,
   Govt. of India,
   R.K. Puram
   NEW DELHI
   Off: 604994

7. Shri Nagendra Nath Sahay,
   Deputy Director of Agriculture (Planning),
   Department of Agril.,
   Vikas Sachivalaya,
   PATNA (BIHAR)

8. Shri Jagdish Singh
Joint Director
(A Agril. census)
Agril. census Division,
R.No. 234, 'F' Wing,
2nd Floor, Shastri Bhawan
NEW DELHI - 1100001
Off: 388352
Res: 674897

9. Shri Paramjit Singh
Asst. Commissioner (Hort.),
Deptt. of Agriculture & Cooperation,
Krishi Bhawan,
NEW DELHI - 10001
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10. Shri Ranvir Singh,
Deputy Director of Agriculture (Statistics),
U.P., Krishi Bhawan,
LUCKNOW (U.P.)
Off: 43729

11. Shri S.P. Singh,
Dy. Director (AHS),
Deptt. of Agriculture & Cooperation,
352-Krishi Bhawan,
NEW DELHI - 110001
Off: 384858

12. Dr. Kaushal Vincent,
Monitoring-cum-Evaluation Officer,
'FERNDALE',.
Agriculture Department,
Government of Meghalaya,
SHILLONG - 793003
Off: 25459

6. PROGRAMME STAFF

		Telephone No. (s) Off.	Res.
1.	Smt. S. Saroja Programme Director Reader in Financial Management, IIPA	331-7309	331-6727
2.	Smt. A. Sarada Research Officer, IIPA	331-7309	-
3.	Sh. Santosh Kumar Research Asstt., IIPA	331-7309	-
4.	Shri R.K. Verma Training Assistant, IIPA	331-7539 331-7538	-

Smt. A. Sarada and Santosh Kumar visited the project areas and helped in preparing the case studies before the start of the programme. They also accompanied the participants during their field visits.

USAID SPONSORED TRAINING PROGRAMME ON PLANNING IMPLEMENTATION AND EVALUATION ON AGRICULTURAL PROJECTS (April 20-May 15-1987)

7. WORK SCHEDULE

Day/Date 1st Week	Time	Topic	Speaker
Monday 20-4-87	0930-1100	Inauguration	Dr. G.V.K. Rao Former Secretary Agriculture, Govt. of India
	1115-1245	Project Identification Preparation	P.V. Shenoi
	1400-1515) 1530-1645)	Capital Budgeting Techniques	K.L. Chawla
Tuesday 21-4-87	0930-1100) 1115-1245)	Project Appraisal	S. Saroja
	1400-1515	Case Studies & Exercises	Rakesh Gupta
	1530-1645	L I B R A R Y Work	
Wednesday 22-4-87	0930-1100 1115-1245	Farm Investment Analysis	S. Saroja
	1400-1515 1530-1645	Case Study & Exercises	Rakesh Gupta
	1830-2000	Role of Technology in Agricultural Projects	N.S. Randhawa
Thursday 23-4-87	0930-1100	Social Cost Benefit Analysis	K.L. Chawla
	1115-1245	Data Base for Agricultural Projects	S. Saroja
	1400-1515 1530-1645	Panel Discussion on Issues Relating to Project Formulations	S. Ramanathan

Friday 24-4-87 to Sunday 26-4-87 — FIELD VISIT TO SHIMLA, TO STUDY HIMACHAL PRADESH APPLE PROCESSING AND MARKETING

2nd week

Monday 27-4-87	0930-1100) 1115-1245)	Himachal Apple Processing Project-Discussion	S. Saroja
	1400-1515	Project Finance-Budgetary Implication	K.S. Sastry & Renuka Viswanathan
	1530-1645	Demonstration of Using the Scientific Calculator Representative	D.C.M. Data Products
Tuesday 28-4-87	0930-1130	Issues Relevant to Horticul tural Projects - (Cashew)	C.K. George
	1115-1245	Issues Involved in Inland Fisheries Projects	B.C. Sharma
	1400-1515	Agricultural Project Management	M. Subramanian
	1530-1645	Issues in Watershed Management	D.C. Das
Wednesday 29-4-87	0930-1100	Agro-Processing Projects-Soyabean Processing	R.V. Gupta
	1115-1245	Project Monitoring-I	M. Subramanian
	1400-1515) 1530-1645)	Panel Discussion on Issues Relating to Project Management	S. Saroja
Thursday 30-4-87	0930-1100	Time Management	S. Saroja
	1115-1245	Field Visit Preparation	S. Saroja
	1400-1515	Case Study & Exercises	Rakesh Gupta
	1530-1645	Library Work	
Friday 1-5-87	0930-1100) 1115-1245)	Project Monitoring-II PERT/CPM	M. Thyagarajan
	1400-1515) 1530-1645)	Case Study-PERT/CPM	M. Thyagarajan

3rd Week 02-5-87 to 10-5-87	Field Visits-(Calcutta, Bhopal and Lucknow)		

4th Week

Monday 11-5-87	0930-1100) 1115-1245) 1400-1515) 1530-1645)	Report Writing and editing	
Tuesday 12-5-87	0930-1100	Report Writing	
	1100-1245	Agricultural Project in India: The World Bank Experience	Richard G.Grimshaw
	1400-1515	Policy Issues Related to Irrigation Projects	M.A. Chitale
	1515	Group Photo	
Wednesday 13-5-87	0930-1100) 1115-1245) 1400-1515) 1530-1645)	Report Preparation and editing	
Thursday	0930-1100	Report Presentation-Usar Land Reclamation	V.B. Eswaran
	1115-1245	Report Presentation-Soyabean Processing	S. Saroja
	1400-1515	Report Presentation-Inland Fisheries	S. Saroja
Friday 15-5-87	0930-1100	Evaluation	S. Saroja
	1115-1245	Valediction	Sh. J.K. Arora Joint Secretary Ministry of Agri-culture, Govt. of India, New Delhi.

8. LIST OF FACULTY INVOLVED

Guest Faculty

1. Shri M.A. Chitale
Chairman
Central Water Commission
Sewa Bhawan,
R.K. Puram
New Delhi - 110066

2. Shri D.C. Das
Subject Matter Specialist
Soil & Water Conservation
Ministry of Agriculture
Deptt. of Agriculture & Cooperation
Room No. 111-B,
Shastri Bhawan,
New Delhi - 110001.

3. Shri V.B. Eswaran,
Executive Director,
Society for Promotion of Wasteland Development
Bhartiya Kala Kendra,
New Delhi

4. Shri C.K. George
Joint Commissioner
Horticulture Division
Ministry of Agriculture
Govt. of India,
Krishi Bhavan, New Delhi

5. Shri Richard G. Grimshaw
Agriculture Division
The World Bank
21, Jor Bagh,
New Delhi - 110003

6. Shri R.V. Gupta
Managing Director
National Cooperative Development Corporation
4, Siri Institutional Area
Hauz Khas, New Delhi - 110016

7. Dr. N.S. Randhawa,
Director General & Secy. to
Govt. of India,
Indian Council of Agricultural Research
Krishi Bhawan
New Delhi

8. Shri K.S. Sastry
   Addl. Secretary
   Ministry of Finance,
   Govt. of India
   North Block,
   New Delhi - 110001

9. Shri B.C. Sharma,
   Joint Secretary
   Department of Agriculture & Cooperation
   Ministry of Agriculture
   Govt. of India,
   Krishi Bhavan,
   New Delhi - 110001

10. Shri P.V. Shenoi
    Addl. Secretary
    Department of Agriculture & Cooperation,
    Ministry of Agriculture,
    Govt. of India,
    New Delhi - 110001

11. Shri M. Subramanian,(Former Agriculture Secretary)
    Director
    Dry Farming Research Centre
    Madan House
    Nehru Place
    New Delhi

12. Smt. Renuka Vishwanathan
    Ministry of Finance,
    Govt. of India,
    North Block New Delhi - 110001

IIPA FACULTY

1. Shri S. Ramanathan, Director, IIPA, New Delhi

2. Shri Rakesh Gupta, Lecturer, IIPA

3. Smt. S. Saroja, Reader in Financial Management, Programme Director, IIPA

4. Dr. K.L. Chawla, Senior Management Analyst, IIPA

5. Shri M. Thyagarajan, Consultant, IIPA

9. REPORT PREPARED BY PARTICIPANTS

Training programme on Planning, Implementation and evaluation of Agricultural Projects (April 20 - May 15th 1987)

Monday
20-4-87

The course was inaugurated by Dr. G.V.K. Rao former Secretary, Ministry of Agriculture, Government of India, New Delhi at 9.30 A.M. on 20.4.87. Director of the Institute Shri S. Ramanathan introduced the chief guest and Shri Rao in his inaugural address stressed the importance of such training programmes in the Agricultural Sector. He emphasized the need for improving the skills in project identification and formulation. He felt the delays in agricultural projects are mostly due to wrong identification and formulation. He also explained in detail the various facets of Agricultural projects and the relevance of appropriate technology. Smt. Saroja, Programme Director, proposed the vote of thanks.

In the next session, Dr. P.V. Shenoi, Additional Secretary, Ministry of Agriculture, Government of India dealt with the topic "project identification and preparation". He had prepared a background paper on the subject. He explained the methodology of preparing agricultural projects.

In the afternoon, Dr. K.L. Chawla, Senior Management Analyst, IIPA, explained the various capital budgeting techniques. He explained the concepts of the time value of money, discounting techniques, net present value and internal rate of return.

Tuesday
21-4-87

In the morning session Smt. Saroja, Programme Director, dealt with the concept of project appraisal and investment criteria in economic analysis of projects. She explained in detail the components of technical analysis, financial analysis and economic analysis. She also explained the concepts of sensitivity analysis, risk and uncertainty.

In the afternoon session Shri Rakesh Gupta, IIPA faculty, conducted the case study session and helped the participants in calculations. The participants were trained to find out the viability of the agricultural projects.

Wednesday
22-4-87

In the morning session, Smt. S. Saroja dealt on the basics of Farm Investment Analysis. She explained farm income statements, farm output and income measures, timing of investments, phasing of inflows and outflows etc. with examples and transparencies on the overhead projector.

In the afternoon, Shri Rakesh Gupta again had practical exercises with the participants so that they are able to prepare project documents.

In the evening, Shri M. Subramanian, former Secretary, Ministry of Agriculture, Government of India, and Dr. N.S. Randhawa, Director General and Secretary to Government of India, Indian Council of Agricultural Research had an enlightened discussion on "the role of technology in Agricultural Projects". The participants interacted by showing their real life experiences at the field level.

Thursday
23-4-87

Dr. K.L. Chawla, IIPA faculty, took the morning session and explained the concept of Social Cost Benefit Analysis with examples.

In the afternoon session Shri S. Ramanathan, Director, IIPA chaired the panel discussion where issues related to project formulation were discussed. All the participants came out with the problems faced due to inadequate basic data and lack of trained personnel in formulating projects.

Friday 24-4-87
to 26-4-87

On 24.4.87 the participants along with Shri R.K. Verma Training Assistant left for Shimla to visit the Himachal Pradesh Apple processing unit. There they met Shri Mehta, General Manager of H.P.MC and had discussion with him. HPMC had made all arrangements to receive the group and we are grateful to the authorities.

Monday
27-4-87

The morning session was devoted to the discussion about the field experiences of the visit to HPMC, Shimla. A report was presented in the class room for discussions (included in the book).

In the afternoon, Shri K.S. Sastry, Additional Secretary, Ministry of Finance, Government of India and Mrs. Renuka Viswanathan Project Finance Department had a joint session with the participants where project financing and budgetary Implications were discussed. Here the implications of project financing with external aid was explained with special reference to World Bank, IDA and IBRD financed agricultural projects. Reading material was also circulated by the speakers to the participants and a copy of the same is included in the book.

Tuesday
28-4-87

As the participants were going for their field visits to agricultural projects most of the time was devoted to discuss the different agricultural projects, and issues relevant to them.

In the first session Shri C.K. George joint commissioner, Horticultural Division, Ministry of Agriculture, Government of India explained the technical aspects of Horticultural projects. He also explained about cashew nut processing and the strategies adopted in the development of the cashew nut plantations under the Multi-State Cashew Project and in particular the Kerala Project financed by World Bank.

In the next session, Shri B.C. Sharma, Joint Secretary, Department of Agriculture and Cooperation Ministry of Agriculture, Government of India, dealt with Inland fisheries Project in India. He explained in detail about the fisheries, their history, types of fish, management practices, marketing, and cost-benefit analysis of the project. He explained the economic importance of fisheries as an alternative for other types of cultivation. The viability of fisheries projects were discussed.

In the afternoon session, Shri M. Subramanian, discussed about Agricultural Project Management. He gave examples from real life experience. He discussed about the various management practices prevailing in the field. He also discussed about the different situations faced by field officers where theory does not help in managing the situation. He dealt in detail about how particular situations should be tackled according to circumstances and explained the importance of "contingency management".

In the next session, Shri D.C. Das Joint Agricultural Commissioner, Ministry of Agriculture, explained the issues relating to watershed Management. He highlighted the various critical activities in watershed management which require monitoring to overcome time lag. He circulated four papers relating to watershed management

Wednesday
29-4-87

In the morning session Shri R. V. Gupta Managing Director, National Cooperative Development Corporation, explained the Soyabean processing project, OILFED, Bhopal. He described in detail about the production of Soyabean in the country, in particular about M.P. State. He discussed the importance of cooperatives in M.P. with reference to OILFED and also highlighted the problems and prospects of Soyabean processing, procurement and marketing etc. The project viability of Soya-oil processing were discussed with examples.

In the next session Shri M. Subramaniam discussed the importance and need for monitoring of Agricultural Projects. How timely monitoring can help in achieving the project targets were explained by him. The relevance of a feed back system for control was also discussed.

In the afternoon session Smt. Saroja chaired the Panel discussion on "Issues relating to project management". The participants presented their ideas and problems due to inappropriate manpower planning.

Thursday
30-4-87

In the morning session Smt. S. Saroja explained about time overruns and delays in projects. The importance of time management and analysis of critical factors leading to rescheduling were discussed.

In the afternoon session Shri Rakesh Gupta conducted a case study session on the concept of shadow pricing.

The next session was devoted to the preparation for field visit. Smt. Saroja guided the participants, with reference to the important factors on which they should collect the data for the field report. The report writing and presentation was also discussed.

Friday
1-5-87

Both morning and evening sessions were taken by Shri M. Thyagarajan I.I.P.A. faculty, who explained in detail the concept and technique of PERT/CPM. He discussed the application of this technique with examples from agricultural projects.

FIELD VISIT

Sunday
3-5-87
to 10-5-87

The participants were divided into 3 groups to visit three different Agricultural projects.

The first group consisting of Mr. Jagdish Singh, Mr. C.V. Naik, Mr. V.G. Balar, and Mr. R.K. Odedra went to Calcutta to study the Inland fisheries project. They were accompanied by Mrs. A. Sarada, Research Officer from the Institute. They left New Delhi on 3rd evening and returned on 10th morning.

The Second group consisting of Mr. Paramjit Singh, Mr. K.J. Nandeshwar, Mr. R.N. Prasad and Dr. K. Vincent visited Lucknow to study the project for Reclamation of Saline and Alkali Soils in Uttar Pradesh. They were accompanied by Mr. R. K. Verma Training Associate from the Institute. They left New Delhi on 4th May returned on 9th May.

The Third group consisting of Mr. K.K. Narang, Mr. N.N. Sahay, Mr. Ranvir Singh and Mr. S.P. Singh went to Bhopal to study the Soyabean Processing Plant. They were accompanied by Mr. Santosh Kumar Research Associate from the Institute. They left New Delhi for Bhopal on 4th May and returned on 9th May.

Monday
11-5-87

The whole of Monday was allotted to the participants for preparing their tour reports.

Tuesday
12-5-87

On 12th Mr. Richard Grimshaw Chief, Agriculture Division World Bank, New Delhi enlightened the participants about the World Bank aided agricultural Projects in India. According to him though till recently the emphasis was on irrigation, and now the time has come for improved extension services and technology. Appropriate technology should reach the farmer at his door step. Research should come out of the universities and reach the farmers. The need of the hour is that farmers should respond to research and the results of such practical applications should be evaluated by the experts. It was also seen that research had been done mostly on irrigation projects. During

discussions it came out that practical action research is vital in the areas of dry land and rainfed farming. Various aspects of agriculture like forestry, water management, dam safety, hydrology, flood control, soil erosion were also discussed. While discussing about soil erosion and moisture conservation the "vetiver grass project" was discussed. A Video Tape on this project explained the special advantages of this project. A hand book about the project 'A method of vegetative Soil and Moisture conservations' was distributed to the participants.

In the afternoon session, Mr. Chitale, Chairman, Central Water Commission explained about the "Policies and Planning Procedure for conjunctive use projects". According to him for developing the conjunctive use of water there should be a properly developed integrated organisation. There are four major gaps to achieve the goal which are the knowledge gap, the planning gap, the legal gap and the organizational gap. Unless these gaps are bridged the objective of conjunctive use of water can not fulfilled. Mr. Chitale circulated four papers which are also included in this book.

Wednesday
13-5-87

Report preparation and editing.

Thursday
14-5-87

The three groups who visited three different agricultural projects presented their reports. A copy of each report is also enclosed. The discussion about the "Reclamation of Saline and alkali Soils in Uttar Pradesh project was chaired by Shri V.B. Eswaran, Chairman, Wasteland Board. Smt. S. Saroja chaired the other two sessions. The reports were discussed in detail and the participants brought out their views on the projects.

Friday
15-5-87

Shri J.K. Arora, Joint Secretary, Ministry of Agriculture, Govt. of India, chaired the Valedictory session. Certificates were distributed to the participants. Mrs. S. Saroja, Course Director thanked the participants, the guest faculty, the IIPA faculty, Research staff, and Administrative staff, IIPA, who helped in making the Training Programme a success.

10. LIST OF TRAINING MATERIALS GIVEN BY ECONOMIC DEVELOPMENT INSTITUTE, WORLD BANK

S.No.	Reference Number		Name	Prepared By
1.	555/013 May 76	CN-439	Technical Aspects of Appraisal	Gopi N. Puri and Frank H. Lamson-scribner
2.	CN-348 Oct 1981		Investment criteria in economic analysis of project	Colin Bruce
3.	AE-1023-S Aug 72		Discounting Differences between cash flows to choose among mutually exclusive alternative projects exercise	J.Price Gittinger
4.	NM-2012-P Sept 76		Constraints on the project cycle in country 'Z'	Eugene R.Schlesinger
5.	560/002 Rev Dec 73	AE-1087-P	Comparative B.C. Methods Exercise	William A. Ward
6.	AE-1027-P Jan 73		Comparability of Ranking Exercise. Benefit-cost Ratio Vs. Internal Rate of Return	J. Price Gittinger adapted from Roland N. Mckean
7.	555/048 July 77	AE-1106-P	Deflating the Internal Rate of Return exercise	J. Price Gittinger
8.	555/011 March 73		India well Energizing Internal Rate of Return Exercise	J. Price Gittinger
9.	TE-7028 May 75		Exercise for Sensitivity Analysis Using Road Projects	Leon H. Miller
10.	550/009 Rev Oct. 79	[illegible] 10-P	A Multisector Approach to cash flow and discounted cash flow analysis	Eugene R. Schlesinger
11.	575/009	CN-312	Project Management Under Uncertainty	C.Traylor, Ronald C. Stinson, James L. Madsen, Robert S. Bell and Kent R. Brown
12.	030/031 Rev Dec 1987		Methodology of Farm Investment Analysis	Walter-Schaefer-Kehnert
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PROJECT IDENTIFICATION AND PREPARATION

S. SAROJA

It is felt that the skills to identify, prepare and analyze projects are still inadequate in the agricultural sector. Much attention is paid to policy formulation and planning of a much broader scope that this specific aspect is overlooked and the time and effort spent on project preparation is very minimal. Hastily prepared projects with adhoc values did not produce the expected results/outputs.

Till very recently, the word "Project" has been very rarely used in the field of agricultural planning and development. It was only when the external financing agencies started analysing the project, the importance of proper preparation of project document was appreciated. It is now understood by everybody concerned that preparation of sound projects leads to their effective and expeditious implementation.

Projects are the "CUTTING EDGE" of development. The most critical problem facing us today is implementing the development programs. The root cause of this can be traced to poor project identification and preparation. Even though project identification and preparation are not the only aspects of agricultural development planning, they are the most basic activities. Identification of viable projects will lead to the achievement of national objectives. Careful preparation of the project document will further ensure effective implementation on schedule.

A Project is a whole complex of activities undertaken to achieve an objective. It uses the resources (Costs) to gain benefits. An Agricultural Project will consists of agricultural activities which may be transformed into a project format. For e.g., livestock, land development, forestry development and rural development projects with agricultural component etc. If we have a well defined sequence of investment and production activities, and a set of costs and benefits which can be measured, then we can identify and quantify a 'Project'.

Projects should form a definite and clear portion of a whole program. Even though a whole program can be treated as a single project it is better to have smaller projects, administratively feasible ones which are economically and technically viable.

The project can be a minor project involving a few lakhs of rupees or a major project. The project can be a simple one or a complex one. Simple project is that project where all the resources are available within the control of the project head. If the project requires

interaction with other agencies, which are not under the direct control of the project head then it is a complex one. The project will lend itself to better planning when it is small. It is always better to analyse successive increments or distinct phases of the activity. The return on each addition can be judged separately. In a big project there is a danger of one sector with a higher return masking the lower returns from the other sector.

Projects are the means by which the investment and other planned development expenditures are realized. Proper identification of project depends on the information about the existing and potential level of investment in different regions of the economy. To find and prepare good sound projects is very essential since wrong decisions may prove costly when the economy is facing scarcity of resources - both domestic and foreign capital, skilled personnel, raw materials etc. Even though there are no readymade guidelines to provide right solutions we can learn the lessons from experience.

According to a recent World Bank Paper most of the project decisions are often the result of :-

(a) Personal and emotional attachment of some people who consider "the Project" as a means to attain recognition;

(b) "the project" getting involved with the prevalent political wave;

(c) Pressure for quick results and apparent progress;

(d) parties extending assistance (technical or other) being interested only in promoting what they have rather than in what the situation demands;

(e) designers putting together projects based on "Professional standards" of the industrialized countries in complete disregard to the resources locally available viz. raw materials, skilled manpower, services, etc.;

(f) conflicts between the personal interest of the entrepreneur (government or private) and national objectives;

(g) the encouragement of questionable project due to inappropriate incentive schemes, the use of government policy instruments which adversely distort market prices, etc.

Many of these influences cannot be completely eliminated. Their impact on project decisions can be minimized if while preparing and/or evaluating the project, one refuses to be influenced only by these factors.

THE PROJECT SELECTION DECISION

Selection of good projects is of great strategic importance. Bad decisions once made are not only difficult to retrieve but also severely handicap other economic development effort because of so-called linkage effects. This can be illustrated with many examples from various countries. The project identification process is critical and should be concerned with shaping and reshaping of viable alternatives to allow rational choices amongst an individual project's components as well as different projects. Sound projects should not only be sound technically but should also generate adequate returns to both the investor and the economy. In addition to the economic return, the financial return may be of importance to ensure proper financing of the project or to avoid a drain on the government budget. They should produce products which in terms of quality as well as quantity have adequate markets (at home and/or aborad) and under normal circumstances also have a perspective advantage in production costs compared to its competitors -- local and foreign. Further it should not only fit into the existing phase of the economy but should also not violate its next phase.

IDENTIFYING GOOD PROJECTS

Is this a hard condition to fulfill? Murray D. Bryce in his book "The Basis of Sound Industrial Development" says that it is possible to find such projects in every developing country if enough initiative is shown in seeking them and if people wishing to promote economic development are not distracted along the way by the more numerous projects of doubtful merit. Mr. Murray D. Bryce has offered the following helpful guide for identifying new opportunities. These hints are equally applicable to the agriculture sector also.

<u>Study Imports</u>: Considered along with any domestic production, imports indicate an existing market and suggest opportunities for new project to satisfy existing proven demand.

<u>Investigate Local Materials</u>: The quality or price of certain raw materials or may lead to opportunities to produce competitively for export and/or domestic markets.

<u>Study Available Skills</u>: Labor and management skills which have already been developed in the area, such as in processing agricultural outputs may suggest the possibility of producing other things requiring similar know-how. For export possibilities, it will be useful to compare labour costs at different skill levels with the international market.

<u>Make Industry Studies</u>: Good opportunities may be found in expanding or diversifying already established agricultural processing. A thorough

analysis of existing industries may lead to identifying logical new projects.

Originate or Apply Technology: Changing technology continually creates new agricultural opportunities which can be identified by reexamining local raw materials and existing products in the light of current scientific and technical advances.

Examine Inter-industry Relationships: The growth of one industry may create opportunities to establish other. The identification of these possibilities can be done by analyzing how the inputs and outputs of various agro-industries fit together.

Evaluate Development Plans: Major development plans (if,in fact, implemented) may create adequate markets for goods which formerly could not be economically produced. The plans should be studied to discover how they will change the market.

Review Old Projects: Projects previously developed but not implemented often become feasible as markets increase or related industries change. It is often possible to find new opportunities in old ideas for which the economic circumstances have improved.

Observe Experience Elsewhere: Familiarity with current development in other countries or regions having somewhat similar environmental conditions may suggest project possibility.

Using Industry Lists: Industry lists such as the standard industrial classifications of the United Nations or Government provide systematic checklists of opportunities. They are useful for suggesting ideas and for making sure that no possibilities have been overlooked.

The possibility of exports based on goods with inputs of local resources (materials, labour, etc.) should be considered. Some goods, like building bricks are practically tied to resource and markets within a few miles but others like canned fruits and meats, cotton,oil, and wheat may be sold in distant world markets.

Through the use of the screening approaches, it is usually possible to draw up long lists of products whose manufacture might be economically feasible for the domestic market and/or export.

With the assistance of agriculturists, engineers and economists who have specialized knowledge of factors affecting the feasibility of projects in the various agro sectors, the screening should be continued until the list is narrowed down to the most desirable possibilities.

These opportunities should then be subjected to more intensive investigation, project preparation and analysis.

ELIMINATION OF BAD PROJECTS

If unsound projects are screened and eliminated before the expenditure of substantial resources of manpower and money, we will have accomplished bulk of the job. Most "white elephant projects" have one or more of the following undesirable characteristics.

1) Technically not sound;

2) Poorly planned;

3) Very, very risky--the level of risk being not entirely unavoidable by way of possibly selecting another alternative;

4) Weak financing;

5) Poor management;

6) The wrong market mix;

7) Inadequate raw materials or other inputs;

8) They lack advantages in respect of production costs against competitors, local or foreign;

9) Overambitious in their forecasts of production possibilities, costs, sales and profitability;

10) They try to cover their weaknesses under the cover of grand design without regard to the real level of the needs for the economy;

11) May try to achieve profitability by artificial means such as subsidies and incentives which end up in exploitation of the local consumers through high mark ups.

Wherever self sufficiency, in a critical area such as national health, welfare, regional balance, defence, etc. is the prime motivation for setting up a project, it will be more worthwhile to examine other means of achieving the same objective at less cost of resources than to supercede commercial and financial viability tests.

DEVELOPMENT OF PROJECTS

What has been described above is a broad exploratory stage whereby projects which are not promising can be rejected for the time and those

which look promising can be developed for a rigorous appraisal for later decisions.

The more promising projects to come out of the preliminary screening process would be those which produce items which have local or foreign demand and can be produced efficiently in terms of resources and inputs used.

Orderly development of a promising project demands that investigation and analysis should be so carried out as to leave open the option of cancelling the project at any stage--with a minimum of wasted expenditure, if it becomes clear at any point in time that the project is not worthy of being carried forward any more. To accomplish this objective:

1) technical, economic and financial investigation and analysis of the project should be coordinated and phased in a defined pattern so that no important aspects are left out or neglected;

2) financial commitments should be made only on a step-by-step basis as the soundness of each additional step can be proven by the work already done. This is particularly important for the engineering services and even more important for purchase of equipment and machinery.

The process of preparing and selecting possible projects might pass through the following stages:

a) Preliminary screening and identification.

b) Preparation of preliminary projects to determine preferences between the various possibilities (alternatives).

c) Allocation of priorities and resources to further project studies.

d) Preparation of the final projects.

e) Installation of the new productive units.

More often than not, however, since there are many interdependent areas, the development of a project is commenced simultaneously on various lines and an attempt is made to arrive at acceptable solutions through a series of successive approximations based on optimizing results at each stage.

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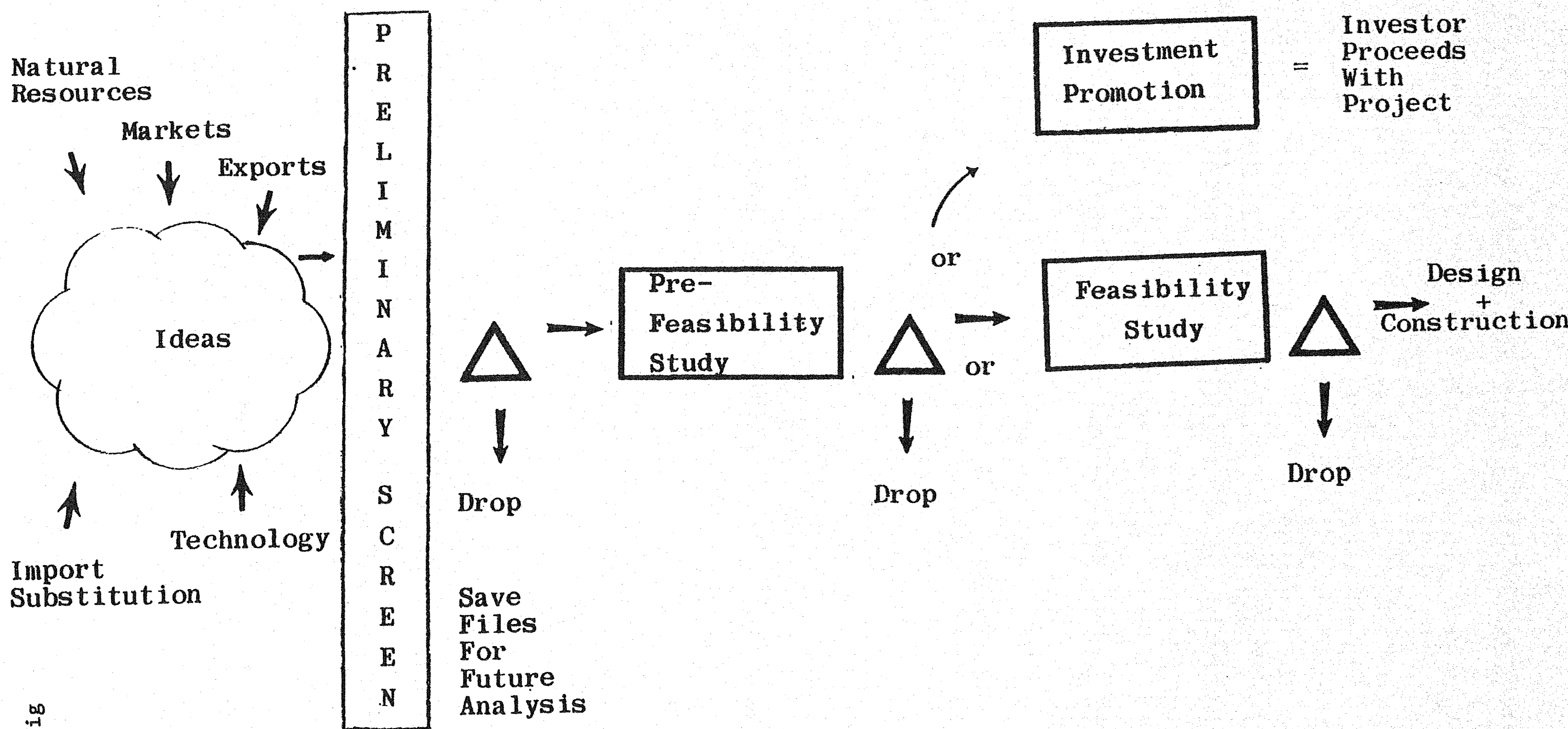
PROJECT IDENTIFICATION & PREPARATION FLOW CHART



SOME STAGES OF DEVELOPMENT AND PREPARATION PROCESS

The earliest stage is of Prefeasibility Studies which are reports on potential projects with details just sufficient to indicate the general promise of the project as an investment in terms of the various possible alternatives. The more expensive, technical, engineering and financial analyses of a potential investment are postponed; instead discussion centers on the size and nature of the market, the requirements in terms of quality and quantity of the product, the availability of required inputs, the locational aspects, approximations of project cost, and other general factors having or likely to have an important impact on the proposed venture. The purpose of a pre-feasibility study is to give enough facts to make a decision on whether to devote more resources to more investigation and the preparation of detailed (feasibility) study amplifying the data gathered at the pre-feasibility stage.

A Detailed (Feasibility) Study should cover detailed plans for establishing and operating the enterprise and inter alia include:

1) the requirements of the proposed project as to quantity, quality and specifications of each kind of raw material, supplies, labor, fuel, power, transportation, water, waste disposal, and other inputs need;

2) specific estimates of the total capital;

3) detailed estimates of production and overhead costs for the proposed plant on the basis of stated assumptions as to the unit cost of each item needed (also distinguishing between foreign exchange and local currency).

A feasibility study should also note various alternatives considered and evaluated such as:

1) plant size (economies of scale)

2) alternate process and technologies

3) alternate locations.

Such studies require expertise in the specific field including up-to-date knowledge of technology and cost related parameter. "Project Engineering" which is the part that describes and relates to technical process and "Project Economics" which deals with the economic phase of the project are combined and all these elements are weighed in accordance with certain economic criteria (yardsticks) so that the desirability and feasibility of the enterprise may be assessed and an investment decision taken.

Once an investment decision has been taken, work is begun on the detailed Project Report Studies which note in detail engineering designs as well as economic requirements envisaged in the feasibility report and check with all basic assumptions and other data. On the basis of better, more recent data, it is to be expected that the original estimates would change somewhat. As better data are available, the project would be reevaluated to assure that the changes do not adversely affect the economics of the project to the point where it becomes undesirable. Continuing checks should be made on project viability during project implementation so that no untoward trend goes unnoticed.

CONTINUOUS REEVALUATION OF PROJECTS

Projects have to be continuously reevaluated. The sole purpose of the project development work is the ultimate establishment of an enterprise justifiable in terms of clearly laid out goals and if at any point in time it becomes clear that these objectives cannot be realized, there remains no justification for further effort. Continuous reevaluation in the light of information generated through the identification, development and preparation of a project may also at times reveal that the project as conceived originally is inappropriate and needs to be revised so that the desired objectives or some other comparable goals can be achieved and the effort that has gone in thus far suitably utilized. If there are very adverse developments, projects should even be cancelled. Procedures for identifying, developing and preparing projects vary from one situation to another. In all cases, adequate information should be gathered and analyzed on technical, commercial, financial, economic, and management aspects.

ASPECTS OF PROJECT PREPARATION AND ANALYSIS

To design and analyze effective projects, all aspects must be considered and reconsidered at every stage in the project planning and implementation cycle.

TECHNICAL ASPECTS

Technical analysis concerns the project inputs and outputs of real goods and services. Technical analysis has to be thorough and precise as the other aspects depend upon these assumptions. The technical analysis will examine the soils in the region of the project, rainfall, availability of water, its distribution, crop varieties, livestock species suited to the area, pests, epidemic etc. The technical analysis will determine the coefficients of production, potential cropping patterns, inputs required and potential outputs. Technical analysis will also examine the marketing and storage facilities and the processing systems required. The gap in basic information should be identified before planning the project. Soil surveys, ground water

surveys, etc. will lead to realistic choice of technology and better project planning.

INSTITUTIONAL ORGANISATIONAL-MANAGERIAL ASPECTS

This aspect has an important effect on project implementation. The project design should take into account the customs and culture of the participating farmers. Provisions must be made to help the farmers to shift to new patterns of lives, and teach them new skills. The project plan should not be overly optimistic about acceptance of change. The project must also relate to existing institutional structure like land tenure systems, size of holdings, etc. The project must clearly state the details of relevant project authority. Too often new projects build up opposition and jealousies.

The organisational linkages must be spelt with proper delegation of authority. The proposed organisation structure may not be able to break out of traditional organisational forms leading to a failure of the project. The project must have enough provision to develop an information system to help the supervisors to monitor the project. It should have training facilities, enough authority to keep its accounts separately and make disbursements.

An agricultural project design that assumes new and complex managerial skills on the part of participating farmers is sure to lag during implementation. If we want crop farmers to become dairy specialists, we must allot time for them to gain their new skills. There must be extension agents to help farmers to acquire skills. These agents must be provided for in the organisation design and in the costs of the project. In considering the managerial and administrative aspects of the project design, we must be sensitive to future problems, as they may lead to delays in implementation which will result in decrease of expected benefits.

SOCIAL ASPECTS

Social implications of the proposed investments must be carefully analysed. The effects of the project on employment, growth of particular groups/regions, should be analysed with reference to its future impacts on the society, quality of life etc. The contribution of alternative projects or other designs of the same project should be compared.

COMMERCIAL ASPECTS

These include arrangements for marketing the output, supply of inputs, credit and other facilities needed to operate the project.

It is essential to ensure demand at a remunerative price. The new expected price levels and the demand pattern may affect project viability. The question of exports, processing of outputs, packaging etc should also be studied to explore other possibilities.

On the input side, proper arrangements to supply the required inputs like pesticides, high-yielding seeds, tools, fodder etc must be made. The quality, quantity and price of the inputs must be monitored and adequate timely supplies must be ensured. Commercial aspects should include arrangements for the procurement of equipment and supplies. Fair prices and competitive bidding must be ensured.

FINANCIAL ASPECTS

The financial aspects of project preparation and analysis cover the financial effects of the proposed project on its participants. We will have to prepare budget estimates year by year with reference to revenues and costs. When the farmers' families are participating in the project we will have to estimate all remuneration due to them with reference to the cost of family labour, management skill, own capital etc. In the same manner, a part of the family income may be in the form of home consumption. The farm budget should reflect the real picture and it becomes the basis for determining the amount of subsidy, loans, credit terms, incentives etc. We may have to assess the incremental farm income, the effect of price changes on farm income and the effect of subsidy, incentive etc. on the investment.

When a project is undertaken, the capital costs, the operating costs and the benefits have to be analysed to find out the timing of different inflows and outflows. Such questions like, when will the project start realising benefits, and when will it be able to cover the administrative costs, face us. We must find out what are the new tax revenues, and when will we able to recover the capital costs. Finally, we may have to analyse how the project financing will affect the national budget.

ECONOMIC ASPECTS

In this part, we try to evaluate the contribution of the proposed project to the development of the total economy. We try to justify the use of scarce resources from the society's angle.

Financial and economic analysis are thus complementary. Even though the same technique of discounted cash flow is applied in both the cases, there are three very important distinctions between the two.

Firstly, in the economic analysis taxes/and subsidies are treated as transfer payments. The sales tax paid by buyers when they purchase the output, the new tax paid by the production entity to the government are not treated as costs. Conversely, a government subsidy to the project is a cost to the society, therefore it is an expenditure of resources. Such adjustments are not necessary in the financial analysis.

Secondly, in the financial analysis market prices are normally used. These take into account taxes and subsidies. In economic analysis these prices are adjusted to reflect more accurately the social and economic values. These adjusted prices are called "Shadow" or "Accounting" prices.

Third, in the economic analysis interest on capital is separated and not deducted from the gross return because it is part of the total return to the capital available to society as a whole. In financial analysis interest paid to external suppliers of money may be deducted to derive the benefits stream available to the owners of project. But interest imputed or "paid" to the entity from whose point of view the financial analysis is being done is not treated as a cost because the interest is part of the total return to equity capital contributed by the entity. Hence it is a part of the financial return that entity receives.

The methodology of comparing costs and benefits is the same for either an economic or a financial analysis, but what is treated as cost and what is treated as benefit are different.

The techniques of economic analysis help us to identify projects that make the greatest contribution to national income. The economic analysis also takes into account the opportunity cost of labour and other inputs - the amount we must give up if we transfer a resource from its present use to the project. Those projects with the best return to capital, given the total resources available, are selected for implementation. Inherent assumption of this approach is that the capital is the most important limiting factor to faster economic growth. Even though all the productive factors combine in a project to create the incremental new income, our methods do not address to the question of evaluating proportionate contribution of each factor.

In our analysis we will determine the amount of the income stream generated over and above the costs of labour and other inputs, but in order to specify who actually receives it, we will have to do further analysis. The issue of income distribution will have to be treated along with other social objectives. We will have to develop income distribution weights. Instead of simply choosing a project, we may have to choose those projects which have the most desirable effects on income distribution.

PROJECT CYCLE

There is a natural sequence in the way projects are planned and carried out and this sequence is called the project cycle.

IDENTIFICATION

The first stage in the cycle is to find potential project. There are many sources from which ideas may come. Local leaders and technical specialists will have a number of new ideas. Ideas for new projects can evolve from the present programs. Analysis of import and export trends may also bring in new ideas.

In the sphere of agriculture development, the national plans identify priority sectors like land settlement, livestock production, fisheries, irrigation, food processing, crop production etc. In the course of preparing the National plan the implementing agencies may be encouraged to go ahead with project details.

A survey of the State or district to project the future needs over the next decade or so will also enable us to identify potential projects. The gaps in existing plans and programs, unsatiated demands, expected new demand etc., will also point to new areas of investments.

PREPARATION AND ANALYSIS

Once the projects are identified, the process of detailed preparation and analysis of project begins.

The usual first step is to undertake a feasibility study that will provide enough information for decision making. Quite often we may have to prepare more detailed feasibility studies. The feasibility study should define the objective of the project clearly. It should explain the alternative ways achieving the same objective so that the project planners are able to exclude poor alternatives. The feasibility study should also shape the project to fit its physical and social environment.

As projects are planned in greater detail, financial and economic analyses should start side by side. It is better to do it at this early stage, instead of facing a difficult situation to accept or reject a project on financial or economic grounds, when the expectations and vested interests have grown much larger.

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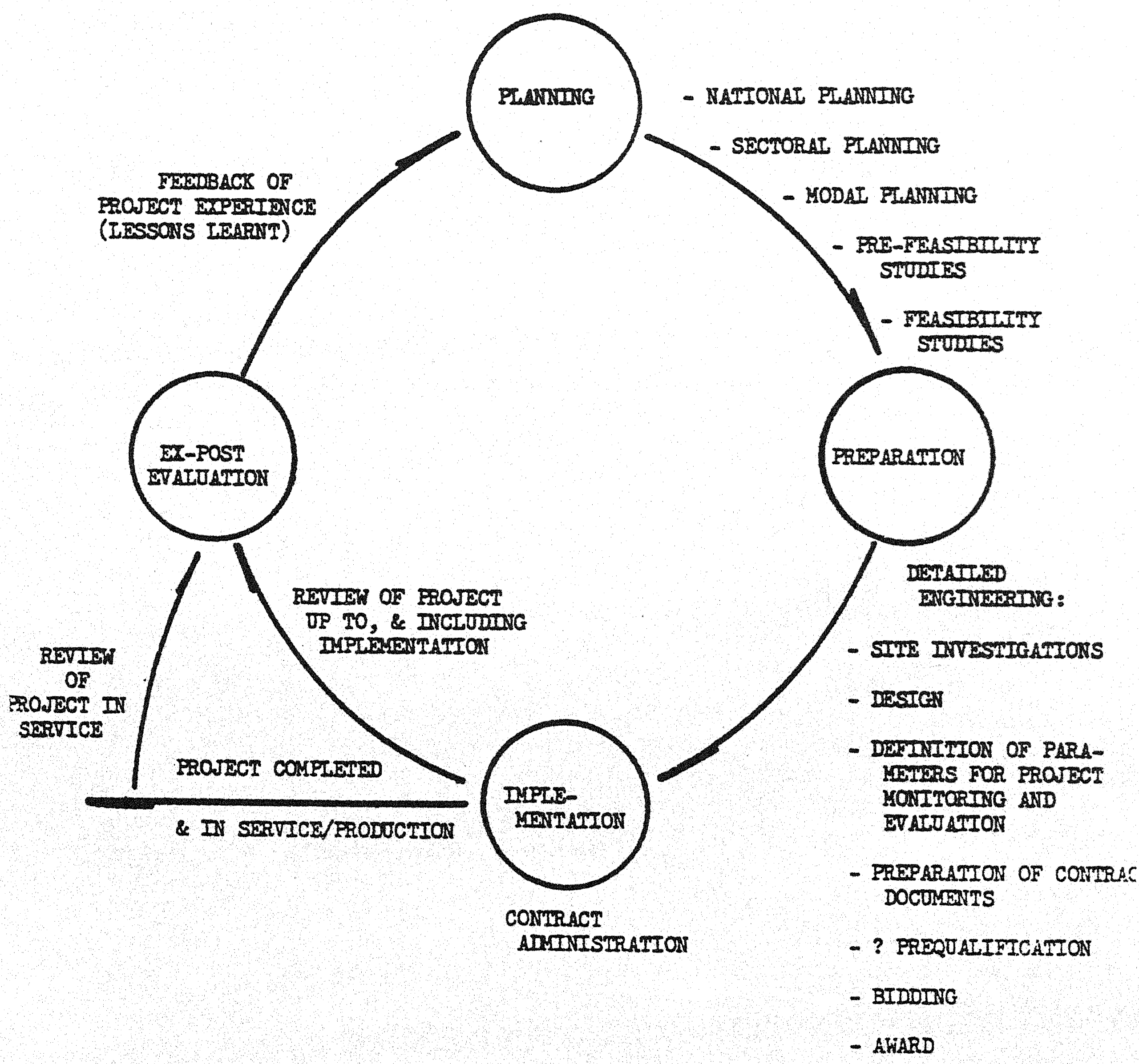
THE PROJECT CYCLE



Patrick O. Malone

Once the feasibility studies have indicated the likely worthwhile, detailed planning should start. Careful soil surveys, cropping patterns, month by month estimates of labour and other inputs, farm budgets etc. are needed to measure costs and benefits. A realistic plan of implementation along with the organisation chart is a must. Proper accounting procedures must be laid down to avoid delays and future problems.

APPRAISAL

After the project has been prepared, a critical review and reexamination is essential. This provides an opportunity to reexamine every aspect of the project, to assess its validity and reliability before large sums of money are committed. The assumptions and data base can be rechecked and serious flaws can be averted.

IMPLEMENTATION

Implementation is the most important part of the project cycle. The more realistic the project plan is, the more likely that it can be implemented. Project management has become a separate art by itself. Project implementation must be flexible. When circumstances change, project managers should respond intelligently. Greater the uncertainty of various aspects, more innovativeness should creep in so that reshaping and replanning take place quickly. It will become a kind of mini-cycle within the project cycle.

EVALUATION

Final phase in the project cycle is evaluation. Evaluation may be done to gauge the success or failure of the project. The project experience will be a learning process. Evaluation may be done during the course of a project and can be repeated also to monitor the project. This will bring the problems to project management group to enable them to take action. Project Audit can be undertaken to critically review the objectives to the project. The technology, the institutional, organisational, and managerial arrangements should reexamined to check whether those proposed were appropriate. The actual financial aspects, and the economic implications should be compared with the assumptions to find out the difference between fantasy and reality. We must know how the project in practice compares with each aspect of the original project analysis. The audit must also consider the response of project management and the sponsors to change in circumstances. The timeliness and the appropriateness of the response should be analysed. These evaluations help us to prepare better projects and manage them better.

A CHECKLIST

An outline of information required for projects including expansion of existing ones is presented below. This list is most suited for Agro-processing projects.(Courtesy; Evaluation of Industrial Projects. Project Evaluation Series, Vol I. Selected Studies presented at the Interregional Symposium in Industrial Evaluation held in Prague, Czechoslovakia, 11th to 28th October 1965, United Nations,1968.)

1. SUMMARY

Type of plant and kind and quantities of commodities to be produced.

Location, illustrated by map showing surroundings and tie-in with transportation facilities and existing utilities.

Distance to sources of supplies and raw materials and to markets.

Relation of project to farmer's present operations, if any. Benefits, cost and profitability.

Reference to any applicable reports (attached or readily available elsewhere).

2. COMMERCIAL ECONOMIC ASPECTS

a) Markets

Local or regional market trends during past five years for each major product, tabulated to show:

- Domestic production; imports and exports; net local consumption and anticipated development of the local market.
- Present per capita consumption in country, and comparison with other countries.
- Local laws, regulations or customs affecting marketing of proposed products, including import and export duties, tariff, quotas, restrictions and subsidies.
- If part of proposed production is intended for export, show for each major product:

Number of units expected to cater for export; the size of proposed market and costs of transport and import duties at the other end.

b) Farmer's Present Operations, If any

Description of present operations, including subsidiary operations.

Complete financial statements, including income, profit and loss statement.

Present production capacity for each product.

Sales volume and value of each product for past five years, showing separate figures for domestic and export sales, if any.

Domestic and export prices, of plant for past five years.

Estimated production of each major product in present plant for next five years.

Estimated additional production required to meet overall demand for next five years, including intended exports.

c) Competitors

Names, location present and future output, production costs and selling prices of present local competitors in the same field of production.
Information as to any anticipated change in competition, such as expansion, modernization, new plants, new competing products, etc.

Information as to foreign competition and any anticipated changes in laws or regulations which might affect volume of imports.

d) Competitive Position

Selling prices to be met in domestic and export markets.

Estimated transportation costs and export expenses.

Maximum competitive selling prices fob plant.

Competitive advantages of proposed project:

Relative availability and cost; labor; availability and quality of raw materials; efficiency of modern production equipment and processes; quality of products; dependability of supply to consumers;

e) Summary of Commercial Prospects

Schedule showing forecast of sales volume for the domestic market and each export market, and percentage total market claimed in each case, with full explanation and justification.

Justification of proposed capacity of plant to be constructed.

3. ENGINEERING ASPECT AND TECHNICAL SOUNDNESS

a) Design

Climatic conditions, rainfall, time and length of wet and dry seasons, soil characteristics.

Farm Plant lay-out, including storage for raw materials, seed, pesticide, fertiliser availability and finished products and provision for possible expansion.

Tie-in with transportation system and infrastructure development.

Type and size of major installed equipment items and structures, and justification of the selection of units and processes. (Avoid both obsolescent and experimental technology.)

Function performed by each major unit.

Process flow sheet.

Auxiliary capital equipment (standby, spare parts, transport, materials handling, etc.).

Patents and Licenses involved, if any.

Planned capacity and build-up of output after start-up.

Estimated output as percentage of plant capacity for each of first five years of operation.

Anticipated use of scientists on special phases of final project design.

b) Utilities Available or to be Provided

Requirements, source availability, cost and reliability of all utilities. Pertinent data on each system, and reason for selection of source in each case, including comparison of advantage of purchasing against in-plant production.

Power requirement (KWH) in peak demand and annual consumption, initial and future.

Electrical system shown by diagram covering major power uses.

Fuel for heat, steam and plant processes.

Water balance of plant where applicable. Problems relative to water treatment, disposal of effluents (Liquid and gaseous), including any which may be noxious or dangerous.
Transportation facilities for raw materials and finished products.

c) Materials for Use in Manufacturing Processes

Quantity, specifications, source and availability of raw and semi-finished materials.

Proved reserves in case of minerals.

If semi-processed materials are to be obtained from another plant, evaluate the technical and economic soundness of such plant.

Estimated costs, possible cost variations, custom duties, any preliminary agreements on price and delivery and details of any contracts entered into for supplies and major raw materials.

Available facilities for handling and storing.

d) Plans and Specifications

Preliminary plans for all construction work in sufficient detail to permit calculation of work quantities.

Outline specifications for equipment and construction, defining particularly those standards of quality which will have a significant effect on the cost of construction, with specific justification for any unusual standards adopted to conform with local conditions.

e) Construction Labor, Materials and Equipment

Manpower requirements and availability, including skilled and unskilled labor, and technical and supervisory personnel.

Local availability of cement, steel, aggregates, water for concrete, building stone, lumber and other construction materials.

Types of construction equipment required for the work, indicating what is available locally and what must be imported.

f) Special Construction Problems Foreseen

Climatic conditions, especially time and length of wet and dry seasons as they affect construction schedule and equipment use.

Necessity of keeping an existing plant in service.

Time required to obtain delivery of imported materials and equipment.

g) Plan for Execution of Project

General construction plan and other operational plans.

Proposed methods of contracting for engineering, purchase, construction, and construction supervision.

Tests to be performed on completed plant\pilot crop production.

Equipment guarantee to be required.

Engineering and construction schedules\operational schedules.

h) Operating Organization and Quality of Management

Description of organization which will manage the business and supervise its operation, accompanied by organization chart, present and projected.

Required number and qualifications of management and technical employees. Experience records of available key management and technical personnel. Number, qualifications and availability of required operating employees. Plans for recruiting and training.

Provisions for competent management and maintenance throughout the life of the proposed loan.

i) Overall Technical Soundness

Justification of selection of location for project.

Proved reliability of plant processes, seeds and other inputs.

Superiority of adopted technical processes.

Analysis of any adverse factors and measures to overcome them.

Assurance that plant described will produce the quantity and quality of products specified, on a continuing and dependable basis.

4. FINANCIAL ASPECTS

a) Estimated Capital Cost

Estimates of cost of land, engineering and construction.

Total estimated capital cost in local currency.

To be financed by applicant.

To be Financed by loan\grant.

b) Working Capital Requirements

Amount required at start-up of plant and at the end of the first, second and third years of operation, to cover raw materials, spare parts, auxiliary materials, goods in process, finished goods, accounts receivable and cash on hand.

Sources and availability of local and foreign currency funds required.

Anticipated occurrence of seasonal peaks in working capital requirements and method contemplated to meet such peak financial requirements.

c) Production Cost (broken down to local and foreign currency)

An estimate of the direct cost of producing each of the major products and any intermediate products, supported by detailed calculations.

Adopted farm wage rates and production factors used in production cost analysis, taking into account legal wage and salary scales, including all fringe benefits such as social security, vacation pay, medical allowances, displacement allowances and travel pay, etc.

Provisions included for personnel facilities such as transportation, housing, subsistence, recreation, medical care, etc., if any.

Number of shifts and mandays of operation per year used in calculations, and basis for determination.

Government preferences or allowances taken into account such as: exemption from or deferment of any general or specific taxes on products; exemption from or deferment of corporate or local taxation; any special depreciation allowances for tax purposes, any special incentives.

Estimated effect of possible wide fluctuation of any cost factors entering into computations.

Where applicant is producing the same or equivalent products in an existing plant, shown present production cost in same general form.

Availability of foreign exchange to permit necessary imports of materials and supplies, if any.

d) Costs of Distributing and Selling

Description of methods of distributing and selling products and estimate of costs there of.

Cost of advertising, if any.

Administrative expense.

e) Selling Prices

Proposed selling prices in domestic and export markets.

Deduction for cost of selling, distributing and transportation.

Net selling prices at the farm gate and adjustments that might be made in case of wide fluctuation of any of the cost factors.

f) Profitability

Analysis of predicted profit and loss and forecast of earnings, receipts and expenditures.

Estimated level of production and sales and break-even point.

Estimate of net annual foreign exchange earnings from exports, if any.

General conclusions as to commercial profitability of the enterprise, including percentage of returns on total investment and on owner's equity.

5. NATIONAL ECONOMIC BENEFITS

List of benefits which will accrue to the economy, in addition to the profits earned by the project owners, such as: taxes paid to the Government by the industry and import tariffs included in proposed sale prices of products.

More effective utilization of labor as compared with other available occupations.

Provision of a market for local raw materials.

Foreign exchange gain if products are exported, after taking into account any foreign exchange costs in project ope ation.

Benefits to consumers on account of lower prices or more dependable supply of goods.

Alternatively, if new domestic production is going to be heavily protected, there may be substantial costs to consumers in terms of higher prices or worse quality.

Stimulation of other industrial efforts.

Training of people in agricultural operations and management.

Evaluation of above and other possible benefits in monetary terms where feasible.

THE NEED FOR PROJECT ANALYSIS

S. SAROJA

Most countries pursue policies aimed at increasing the level of investment and ensuring that mix of investment projects reflect the nation's social and economic goals. An investment strategy may be implemented through public sector projects, joint public-private activities, the provision of incentives to private investors,or some combination of these. All these methods involve the expenditure of public funds. This is obvious when government undertakes the investment itself or acquires shares in a joint venture. With investment incentives for private investor, like tax holidays,tariff concessions, special tariff protection, or access to certain inputs at preferential prices there is either a subsidy paid out of public funds or a loss of potential tax revenues. Since it is widely accepted that government should spend funds to advance the nation's social and economic objectives, it is essential to establish guidelines for selecting investment projects that most deserve public support.

While the problems of stimulating and guiding investments is a general one, it has particular importance for developing countries. Not only is it common for governments in developing countries to participate directly in some aspects of production but there is also considerable evidence that the prices used to calculate the profitability of projects do not reflect the costs or benefits as they affect society. In such a situation,investments undertaken on the basis of market prices may yield lower returns to society than alternative projects.

Investment guidelines that are used often consist of a simple series of general principles. For example, agricultural projects may be given the highest priority because self-sufficiency in food production is considered essential or industrial project may be favoured because rapid growth of manufacturing is thought to be the best path to development. Within these broad rules, more specific criteria are usually given. Projects may be implemented if their output can be exported or will substitute for imports, thus earning or saving foreign exchange; or if the project uses relatively much labour and little capital per unit produced, thereby helping to ease the employment problem; or if the project is located in a rural or depressed area, thus removing regional disparities.

The difficulty with these criteria, or any other similar set of rules, is that while each individual rule has merit, there is little theoretical foundation for them as a whole and their application generally will lead to erroneous and conflicting results. How do we choose between two agricultural projects: One yielding a large volume of output by using imported tractors but generating less employment; and a second yielding a smaller volume of output but generating more employment, using less capital,and less foreign exchange? Each project

makes some contribution to the usual development objectives, yet we need some way of choosing between more output with fewer jobs and less output with more jobs.

Or consider the frequently used criterion,"net foreign exchange savings". All too often this is used in a meaningless way. Semifinished products or raw materials generally will cost less than the final product that embodies them. The final product price will include payments for labour,capital services, and other inputs, such as water and electricity,where as the price for the raw materials or semifinished products will, by definition cover fewer of these costs. Hence it is easy to show that banning an import and importing its component parts instead will "save" foreign exchange. By applying this criterion, one could reach the conclusion that almost all products, in every country, should be domestically produced. But this crude measure of "net foreign exchange savings" neglects the domestic resources required to save or earn an unit of foreign exchange. Again we must be able to choose among efficient and inefficient foreign exchange-saving projects, that is, between projects that substitute for large quantities of imports at a high cost as against ones that earn a small additional amount of foreign exchange while providing numerous jobs and using few scarce domestic resources.

The way out of this dilemma is to devise a set of weights for our various development objectives. These weights should be for comparable units so that they can be added, allowing us to analyse each proposed project in terms of the contribution it makes to all our objectives taken together. Thus a project may receive a relatively low "score" for creating new jobs but high marks for increasing output and earning (or saving) foreign exchange. The project's total contribution to the various and sometimes conflicting development objectives can then be calculated and compared to similar calculations for other projects. We can then rank the projects by their scores and select those with the highest scores, because they make the largest contribution to all development objectives together. These projects would then be included in the development plan or otherwise put forward for government support. In this way we can be sure that limited public funds are spent in a socially optimal manner.

The task that confronts us is to develop a consistent and generally acceptable set of weights that will select just those projects that will yield the maximum benefits for a given expenditure of public funds. Project appraisal is a technique that permits us to derive such a set of weights, or prices.

Although most decision makers are aware of the existence of project appraisal as a technique for screening investment opportunities, the use of this tool is not widespread. In part,this reflects the requirement for greater analytical skills in project appraisal than are needed for most of the broad guidelines often used instead. And because trained economists represent a scarce resource, there is a cost involved in

applying this tool. However, the complexity of cost benefit analysis is easily exaggerated and often a rather simple approach, can yield substantial improvements in project selection.

Second, it is often felt that project analysis will reject capital-intensive techniques in favor of labour-intensive ones. And since capital-intensive techniques are somehow considered "modern" and "progressive," while labour-intensive ones have a connotation of "traditional" and "backward-looking,the use of project analysis is sometimes considered a means of retarding growth in developing countries. This belief indicates a poor understanding of project appraisal. The weights, or prices, used to rank projects are determined by and reflect the economic conditions facing society, the available technologies, and the objectives society has set for itself. The projects selected through the application of these prices will tend to be relatively labour-intensive if labour is relatively abundant. But a capital-intensive project can still be selected over a labour-intensive one if the former offers particular export or production opportunities. In short, capital intensity does not rule out a project, but neither does it confer any special privilege.

Finally, because prices are used as weights in project analysis, it is sometimes argued that this technique is inappropriate in a planned economy where resource allocation is determined without reliance on market prices. However,even planned economies have limited resources and must select among various possible investment opportunities to achieve their goals. This eventually requires the use of prices, although not necessarily market prices.

A more serious question is whether we can derive prices that reflect a set of social objectives and economic conditions vastly different from those prevailing at present. In general,project analysis assumes that the changes to be introduced will not affect all prices or economic relationship drastically. If a development strategy envisages major discontinuous change in the existing social and economic framework, the selection of appropriate projects becomes extremely,difficult because it will be difficult to estimate prices, or weights that reflect the altered economic situation.[1] Whether project analysis,which is coming to be recognized as a powerful decision-making tool, can be appropriately used in a given situation is not something than can be answered a priori. One would have to know the economic environment in which the project will be located and the degree of

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1. Precisely what constitutes a drastic discontinuous change is not always clear and depends in part on the rapidity with which the change is to be brought about. A policy to drastically reduce income differences may not be a radical change,from a project appraisal viewpoint, if it is to be achieved over a decade or two, but would constitute a discontinuity in the economic framework if it were to be done within a few years.

change that is being contemplated. Moreover, one must understand the operation of project analysis and recognise its strengths and weaknesses. In order to gain such insight, we briefly explore the theoretical foundations of this tool.

THE PROBLEM OF ALLOCATING SCARCE RESOURCES

Consider a project Planner,who wishes to run his project to obtain the maximum surplus. This defines his objective function:the larger the surplus, the better the project's performance. Assume that a number of different products can be produced in the project each with a known surplus per unit. Alternatively, the same product can also be manufactured by different processes, (that is, techniques) using inputs in varying proportions. Now suppose he has access only to limited number of man-hours of labour capital and other inputs he will wish to allocate these scarce resources, in such a way to the various processes to produce a mix of products yielding the maximum surplus.

This type of problem, broadly descriptive of a large number of economic situations, can be solved to yield information on the amount of capital and labour time to be allocated to each process and the quantities of output to be produced so that the surplus is maximized. In addition, the solution yields a price for each resource. These prices, called accounting or shadow prices, have an economic meaning. They indicate the value of the additional (marginal) product that could be produced if one more unit of the scarce resource were available. To state this differently, we can interpret these shadow prices as indicating the increase in the objective function value(in this case the project's surplus) that would result from adding one more unit of our supply of the scarce resource. Thus the shadow price of labour tells us the additional surplus we could earn if one more manhour of labour were available. Similarly, the shadow price associated with raw-material input tells us the additional surplus that the project could earn if one more unit of raw-material were available. We also obtain a measure of what economists call opportunity costs, defined as the real cost of allocating a resource to its next best use. Or we can say that the opportunity cost represents the value of benefits forgone when resources are shifted from one to another productive activity.

We can now restate the problem . The project manager may be told that he must reach at least certain target levels of output and that his performance will be judged not by the size of the surplus he earns but by the degree to which he can hold costs down. His objective function now is to minimize costs. Finally, rather then be told that labour and machine time are limited , the manager is informed that he must pay these factors of production returns equal to their shadow prices. With this information , the problem can be solved again. It will turn out that the use of scarce resources and the output levels will be the same as before. In short, if we can determine a consistent set of shadow prices and minimum productive targets, and define the objective as cost minimization, the project manager will allocate the available resources

efficiently. Moreover, under certain conditions all resources will be fully employed. (As is frequently the case with verbal descriptions of complex phenomena, we tread perilously close to misleading statements and oversimplification. Nevertheless, such a description gives a broad feel for the principles of optimal resource allocation).

It is now possible to extend our brief description of what is called a programming solution to the economy as a whole. We would need to define society's objective function, which will usually include (but by no means be limited to) the gross national product or income, per capita income etc. Additional social objectives, such as reductions in inter-regional and inter-personnal income differences, environment protection,and the development of national self-reliance,can be either incorporated in the object function or treated as constraints that the economy must satisfy. As a first approximation, we limit our national objective function to gross national product or income. The shadow prices derived will thus reflect only one of society's goals-the maximization of income- and project selected using such shadow prices must be further evaluated in terms of the objectives not included in the welfare function. We shall return to this point later. We also would need a full inventory of the economy's resources- (labour,land,capital, minerals, and so forth-) and a complete specification of the alternative technical means at hand to produce each of the thousands upon thousands of products demanded by consumers or required for further production.

If it were feasible to construct such a model of the economy and then solve it, the solution would prescribe a pattern of resource allocation that would maximize output, reduce the balance of payments disequilibrium, and utilize labour services to the fullest extent possible given the available techniques. As before, a set of shadow prices for each productive factor would be associated with this solution.

It would now be possible, at least in principle, for the planning ministry or some other agency concerned with the allocation of resources to instruct individual producers to use these shadow or social prices in deciding which factors to employ and what products to produce. If each project manager were to minimize his plant's costs using these social shadow prices or, alternatively, maximize the plant's surplus, then the resulting allocation of resources would yield a maximum income level for the economy.[2] And if all scarce resources were allocated to the investment projects or activities that generate the most income when all inputs and outputs are valued using social prices, then the allocation of resources will maximize social welfare, insofar as it is measured by national product.

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2. Computer and data limitations restrict us to solving economic models that identify relatively few products and production techniques. Consequently, we only obtain shadow prices for the few resources identified.

There are thus two sets of prices, or weights, that can be used to evaluate investment projects. The first is a set of prices determined in the market which, not surprisingly we call market or private prices. These prices ordinarily will differ from the prices that can be derived from a consideration of social Welfare and society's overall resource position, which we call social or shadow prices.[3] A project evaluation using market prices answers the question: will this project be profitable for the individual or firm, private or public, that undertakes the investment? But we need to analyze this same project using social prices to see whether it will help maximize the nation's welfare. To the extent that social prices diverge from market prices, there will be projects that earn a surplus or profit but do not contribute adequately to society's welfare. In extreme cases, apparently profitable projects may even decrease social welfare. The larger the divergence between shadow and market prices, the greater the risk that investment decisions based on market prices will not contribute to national objectives. (It is important to note that the mere transference of investment decision-making from the private to public sector is not a sufficient condition for maximizing social welfare). As long as the public sector bases its decision on market prices that diverge from social prices, resources will not be allocated to meet national development goals.

Accepting that investment decisions evaluated using shadow prices will help select a socially optimal set of projects, it remains to be seen how shadow prices differ, if at all, from market prices. Under what conditions will the two sets of prices coincide and what information do we obtain by evaluating projects at market prices? And if a programming model cannot yield the required shadow prices, how do we estimate them?

DISTORTIONS BETWEEN SOCIAL AND MARKET PRICES

Only under certain conditions the market prices for factors of production equal the shadow prices derived from a programming model. There would have to be many buyers (consumers) and sellers (producers), so that no individual's actions could affect economic conditions or the actions of another person. Factors of production must be mobile and the technology must allow for substitution among factors in the productive process. Information regarding any aspect of the market must be available to all, although not necessarily without cost. The productive process used by any firm may not raise or lower costs for any other producer; that is, external economies and dis-economies are ruled out. Market entry may not be restricted. Finally, there must be no

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3. Technically, shadow price can refer to a scarcity value calculated by any programming model, whether of a firm or of an entire economy. However, we will use the terms shadow and social price interchangeable to refer to the latter. They are also equivalent to opportunity cost and scarcity value.

restriction on prices, so all prices can readily respond to changes in supply and demand conditions. If, faced with these conditions, producers seek to maximize their surplus and consumers try to maximize the utility they derive from consumption, then all resources will be optimally allocated for the economy as a whole. (perfect competition and full employment).

In such an economy, the allocation of resources according to market prices would lead to the maximization of profits or surplus for each producer, the maximization of utility for each consumer, full employment of all resources a maximum level of production, and a set of market prices that reflect real economic costs and benefits. To the extent that society's objectives are maximum output and full employment, scarce resources should be allocated using market prices generated by the economic model just described. But in reality, there is no such economic system. The prices generated in the market will not be the same as those required to guide producers and consumers to some social optimum.

Let us discuss the factors that cause a divergence between social and market prices. First, the assumption that the market consists of many producers, so that the action of any one does not affect the others, is not true. Some manufacturing processes have declining unit costs as the scale of operation expands, so that one factory or a few can supply the entire market. Whenever one producer dominates the market, that producer acquires monopoly power and the output price need not reflect the opportunity cost or real social cost of production. Monopoly power also exists when there are legal or administrative barriers to free market entry, such as licenses, patents, or limited access to raw materials. Buyers, too may lack competition. If there is only one or a few buyers-for example, a single purchasing agency for an export crop or a mineral-then the market is called monopolistic and market prices are unlikely to reflect economic costs. (Monopoly elements are not confined to the manufacturing sector. Ghana's predominant position in the cocoa market or Colombia's in the World coffee market indicate that the prices generated in those markets also will diverge from social prices).

Even in cases where there are many producers and consumers, prices may be determined by non-market factors. Government regulations will in many cases influence, if not determine, prices. Minimum wage legislation and maximum price controls are two common examples of government intervention. Only by chance would the legal minimum wage equal the opportunity cost of labour or controlled prices measure the opportunity cost of all factors used to produce a good. To the extent that price controls are enforced, they often will result in distortions of non-controlled prices as well. Perhaps the most common example of controlled prices is the foreign exchange rate, which often is fixed and regulated by the central bank in the country. In the absence of tariffs and controls over foreign exchange payments, the fixed rate might still represent the opportunity cost of imports and exports. But all countries use import tariffs and many also employ quantitative

restrictions such as import licenses and profit remittance quotas. In the presence of such intervention in the exchange market, the fixed exchange rate will diverge, often substantially, from the opportunity cost of foreign exchange.

Market prices will also be different from social prices if there are external economies or dis-economies, which are costs or benefits created by, but not accruing to, the project. The presence of externalities would lead to a misallocation of the resources, even if all the other assumptions described above were met. Consider a paper mill that discharges its effluents into a stream. A food processing plant located downstream must install special purification equipment before it can use the polluted river water. The investment cost of the food plant and the selling price of the processed food now reflect not only the real costs of producing processed foods but also the cost of cleaning up the waste incurred in the production of paper. At the same time, the cost of paper omits the cost of disposing of the paper mill's waste products. To the consumer, the real cost of paper is understated and the real cost of processed food is overstated; to the investment analyst, the project costs are understated for the paper mill and overstated for the food processing plant. The presence of an external diseconomy will result in an expansion of paper production beyond the socially optimum level because its price is too low while the expansion of food production will be retarded. Similarly, the presence of external economies, which are benefits provided by the project for which it receives no compensation, will result in a suboptimal level of investment in such projects. A method of dealing with externalities in project analysis will be discussed later.

Taxes and subsidies are a further distorting element, causing a divergence between social and market prices. Assume an economy without any of the distortions so far discussed, so that the producer's selling price reflects the social cost of production. In such a situation, a subsidy on fertilizer will lower the market price of fertilizer below its true economic cost, while a tax on steel will raise its market price above the social price. It would be seen that a simple way to correct for such divergences between market and social prices is to calculate all costs and benefits net of taxes or subsidies. Unfortunately, that would be an oversimplification. Consider an excise tax on sugar that increases its market price above the cost of production. In calculating the social cost of sugar, we would include only the costs incurred by the plant in producing the sugar, which would not include the excise tax. But in calculating both the social and private benefit of sugar consumption we have no better measure than the consumer's willingness to pay, which would include the excise tax. (This concept called "consumer sovereignty" implies that the ultimate value of all final products is determined by the consumer's willingness to pay). Whether taxes (subsidies)are a distortion between market and social prices or a means of measuring social values and determining shadow prices is a complex issue.

In the presence of all these likely distortions, what role remains for prices observed in the market? Basically, there are two roles. First and implicit in all we have said so far, private market prices are the only ones we can observe and they are the starting point for any estimate of social prices. The two elements of a shadow price calculation are the observed market price and knowledge of possible distortions, which is used to adjust the market price. Second, market prices are used for private project appraisal by public and private enterprises because they measure the costs and revenues that will be incurred by these firms. Public policy makers should be concerned with both social and private appraisal: with social appraisal because it measures the true value of a project to society; with private appraisal because it indicates whether a private firm or public agency will be willing or able to undertake the project.

It should be clear now that a project that is beneficial for society may not be so for a firm, or vice versa. For example, if there is a 10 percent excise tax on sugar, then the social benefit, measured by the price consumers are willing to pay, will be 10 percent above the price realized by sugar manufacturers. If the social costs are not very different from private costs, then the project may be socially beneficial,but the manufacturer may be unable to make a profit because the excise tax drives his price below the consumer's price. Conversely, if farmers receive subsidized fertilizer, their private costs are reduced below social costs and an agricultural project might be profitable to the farmers but not to society.

A divergence between private and social benefits cannot be solved simply by making the firm a government-owned corporation. A decision on whether a project will maximize society's welfare can best be determined by doing a social project appraisal. If it is hoped to attract a private investor or if the state-owned agency that is to undertake the investment project is expected to show a surplus, then the project also must be analyzed using market prices. Should the market profitability of the project be low, then it is unlikely that private investors will undertake that project; similarly, would be unfair to expect the public corporation to show a large surplus,no matter how efficient it may be. If in such a case, the social profitability indicates that the project would make a substantial contribution to national welfare,government may wish to give subsidies to the undertaking, Public or private,in an effort to make the project attractive or simply viable. What form these subsidies might take and how they might best be administered is an aspect of the strategy the economy adopts. However, only after the project has been appraised, using both market and social prices, can the analyst decide whether a private investor should be given some incentive or develop a yardstick for measuring the performance of a public corporation.

IDENTIFYING COSTS AND BENEFITS

We have introduced the concept of evaluating projects with shadow prices. However, before deciding on which prices to use, one has to identify the costs and benefits relevant to a project. Stated simply, a project consists of all the activities required to achieve a desired objective and all the consequences resulting therefrom.

Consider cost first. The items to be included in cost will depend, in part, on whether the project produces (1) a good to replace one being imported (import substitution), (2) a good for export, or (3) a good for additional domestic consumption. An import-substituting project should include all costs necessary to replace the previously imported commodity. Such a project will save on the import of the commodity and on the distribution costs associated with moving the commodity from the port to the consumer. In addition to production costs, we would have to include any additional distribution costs from the point of manufacture to the point of consumption. If it costs less to distribute the domestic substitute than the original import, this is a negative cost, that is a benefit. For export commodities, costs should encompass all items required to produce and transport the product to the point of export. If a project combines elements of both export promotion and import substitution, then the cost will be determined by the proportion of output going to each market.

It is somewhat more difficult to define the scope of costs for projects whose output augments domestic consumption. We would include as project costs the expenditures that must be incurred to achieve the project objective. If existing distributive channels can effectively market the product, then costs beyond the production stage should not be included. Should the project produce an output that requires new marketing facilities, such as refrigerated transport or additional storage space, then these form part of the project cost.

Private or market costs are defined as payments that reduce the cash receipts of the project. Payments for raw materials, rent,fuel,labor,patent rights, royalty fees, taxes, and import duties are all examples of payments that reduce cash in hand. Depreciation is not a cost under this definition;depreciation is strictly a bookkeeping transaction that does not reduce cash flows but represents a decision on the part of the firm not to spend a certain portion of its revenues. The exceptions to the general rule are interest payment and repayment of principal. These do reduce cash in hand but are not treated as costs. Ongoing costs such as overheads, which would be incurred with or without the project, should not be included even if the firm assigns them to the project to calculate private profits. If a cost would be incurred whether or not the project is undertaken, it cannot be taken as a project-induced expense.

Costs and benefits of the proposed agricultural projects are to be identified in a consistent manner. Costs are incurred for using physical goods like fertilizer, materials for construction, land levelling, labour, land, etc. The problems may not arise while identifying the inputs like labour, land etc, but there may be some problems in valuing them, for eg., the value of family labour and the opportunity cost of land. Then we have contingency allowances, taxes, debt service, sunk costs etc. The treatment of each item depends on whether we are doing economic or financial analysis.

Tangible benefits can arise from increased production including increased home consumption, improvement in quality of production, cost reduction, decrease in losses, and from time saving.

Project can lead to benefits or costs extended to it. These externalities are calculated in economic analysis (not in financial); for eg., by developing the rural roads we may induce more farmers to get better marketing facilities. In the same way, an irrigation project may lead to a reduction of fishing in catchment area.

There are also intangible benefits and costs like better education, health, disturbance in traditional family life,ecological imbalance etc.

Having identified costs and benefits, they are given a value reflecting the point of view of analysis: market prices if it is financial analysis and social price if it is an economic analysis.

The next step is to compare time. We try to give greater weight to costs and benefits that accrue earlier in time and discount those that occur later.

CASH FLOWS

The costs relevant to the project analysis are expenditures on goods and services actually used both during investment and operating stages. Relevant benefits are the benefits actually produced by the project. A private farmer would count as costs only actual purchases for which he spent cash and as benefits, the sale of produce, for which he received cash. For this reason, we refer to the flow of costs to and benefits from a project as "cash flow". The expression is also used in social project appraisals even though the concept of cash flow is not strictly relevant where the services generated from public project are not sold. Here the concept of cash flow is very broad and encompasses most of the costs and benefits attributed to the project except depreciation and financial charges. Depreciation is not a cash outflow and the money is retained in the project for further use. It is only an accounting transaction. Therefore to include it as cost in project appraisal would mean double counting.

Finance charges (interest and principal repayment) are also excluded from cash flows in doing social and commercial appraisals. The project appraisal attempts to measure the profitability of all the resources devoted to the project. It is not concerned with the way in which those resources are financed. It may happen that 60% of the project resources are borrowed. The project appraisal is concerned with the productivity of total assets and not with the charges due to the methods of financing. Interest is automatically allowed for in the discounting procedure. The principal loan is also accounted for as investing costs. Therefore the repayment of loan should not be included again as a cash out flow since this will lead to double counting.

The only exception to this methodology will be a private farmer, who wants to calculate his own profitability, not of the project. He may do so by counting both interest and repayment as cash-outflow to find out his final earnings. But he may have to include the original loan as benefit. In the same way, foreign loans may be treated as benefits in the beginning of the project and interest and repayment charges as costs in the end of the project while performing the social and commercial analysis. Therefore the relevant questions are (i) whether the project is being implemented on its own merits or solely because a loan ia available for the project? and (ii) whether the total foreign exchange available to the economy would have reduced if the specific project were not implemented? (iii) In the same way, whether the cost of a loan should be included in the social cost benefit analysis or not depends on whether the society has incurred any additional cost because of a specific project. Given this definition, the vast majority of untied loans (their inflows and repayment obligations) should be excluded from social project analysis.

For social project appraisal, costs include all payments that reduce the availability of real resources to other users. For example, royalty payments in local currency are not a social cost since they do not reduce the availability of such a service to others. If royalty payments are made in foreign exchange, they are a social cost since the foreign exchange used to make such a payment is no longer available to others.

Two social costs covered by our definition often are overlooked and deserve special mention. When a project utilizes some unused facility constructed in the past for another purpose, it is commonly held that such facilities represent "sunk costs" that can be disregarded. This is only true if the item in question has no alternative use, so that its use in the new project would not reduce its availability for any other purpose or user, either now or in the future. Second, a project may incur external dis-economies, that is, create costs outside the boundary of the project. If such external costs can be identified, they should become part of the project's cost. In our previous example of a paper mill that discharges its waste into a river, the mill reduces the availability of clean water to other potential users; the use of the river for sewerage disposal is thus a social cost to be considered in appraising the project.

Benefits occur when the project supplies the additional good or service or reduces the cost of a good previously available. For an import substitute, this is the point where the consumer uses the domestically produced commodity to replace the imported commodity. For an export, this occurs at the point where the domestically produced commodity leaves the country. A commodity that adds to domestic consumption is evaluated as a benefit, either at the point of manufacture or at the point of consumption, depending on whether the cost of the project is defined to include distribution or not. An often neglected benefit is the value of equipment and other assets remaining at the end of the project life. They should be taken as a benefit in the analysis of the original project (and they would be taken as a cost for the project that purchased such assets). Finally, there may be benefits resulting from the project but external to it and hence not directly credited to it. In social project appraisal, such external benefits are counted since they are an additional good or service provided to the nation even though the project may not realize any additional cash inflow from such goods. Thus, if a project creates newly skilled laborers, the value of such an educational service must be included as a social benefit. As a general rule, such external economies should be internalized, that is, fully counted in social project appraisal.

In defining the boundary of a project, it is sometimes useful to ask whether two or more projects should be considered together or treated as separate ones. When the benefits or costs associated with one project differ depending upon whether or not another project is undertaken, the analysis of such related projects should be done jointly. If there is an internal relationship between the two projects, the correct procedure for deciding whether to undertake project A or B alone, or project A and B together, is to evaluate each of these possibilities, that is,A or B, and A+B. The possibility that yields the highest measure of profitability should be implemented. Even if there is a relationship on either the cost or benefit side between project A and B, it may still be desirable to undertake only A or B rather than both together. In fact, the possibility of separating components from a project should be examined as carefully as the possibility that two or more projects must be jointly implemented. It is possible that the measured profitability will increase if certain parts of the project are eliminated. Thus a project consisting of building a new plant and expanding an harbour could turn out to have social benefits that are maximized by building the plant only.

PROBLEMS OF MEASUREMENT

Measurement of social prices can be a formidable task, involving considerable investigative and analytical talent. A project may include scores of items, each with its own private and social price. But the complexity of the task should not be overstated. With some experience, the project analyst will find it relatively easy to identify the prices that are crucial in estimating a project's profitability. Many of the important prices-capital costs, the cost of foreign exchanges - can be

estimated once and then used for all subsequent project appraisals. Thus, after the analysts have decided on the real value to be placed on foreign exchange, this price can be used in the analysis of all projects until the basic conditions governing the foreign exchange market change. It also should be noted that often analytical results will not be affected by any adjustments made on the prices for some of the remaining items. These minor costs can be taken at market price, even though we know the market price diverges from the true economic cost, or a rough estimate of the social price may be made. Thus since the prices for the basic factors of production-capital, labour, land, foreign exchange - have been adjusted, only a limited number of prices, if any, have to be estimated specifically for the particular project under analysis. We can also briefly discuss the problems resulting from the uncertainty of measurement, non-quantifiable benefits, and the problems associated with projects that cause major changes in the economy.

We seldom have definite knowledge of the data required for project analysis. A margin of uncertainty will exist whether we use market or social price. It may be possible to reduce the error by further study and research,but such an effort will in itself entail additional expenditure of scarce resources. So the first question to be answered is whether the margins of error are likely to have a serious effect on our decision to proceed with a specific project. Sensitivity analysis provides an insight into this problem. First, the variables that seem to have the greatest impact on the project's profitability are identified and the value for each variable is changed within a reasonable range to observe its effect on the profitability of the project. If varying a certain price or quantity to reduce the profitability of a project below an acceptable level, then further study is warranted to see whether such a pessimistic outcome is likely.

Consider the opening of a new copper mine. Among the critical elements will be the copper content of the ore and the future price of copper. Assume that, using reasonable or best available estimates for these variables, the project turns out to be a good one. We now wish to know what effect a lower copper price or lower ore content would have on the decision to implement the project. We would re-estimate the project's profitability using copper price of, say 5, 10, and 20 percent below the original estimate together with alternative assumptions of the copper content of the ore. If, using the most pessimistic price and ore content assumption, the project still appears profitable, then it will have a reasonable chance of success. Should the results indicate that a world price 10 percent below the level originally assumed will depress the return below a minimum acceptable level, then it will be worthwhile to assess the future trend in world copper prices more precisely to see how likely this outcome may be.

The margin of error surrounding the estimate of social prices will be even greater than for market prices. As a consequence, there often will be a considerable range of opinion about the true social values, especially of labor,capital, and foreign exchange. Again, further research may narrow the range, but it is often possible to show through

sensitivity analysis that the project would be acceptable, or unacceptable , for any estimate of social prices within a reasonable range of uncertainty. If so, the argument on the precise social value of a particular factor is not crucial to the analysis of the project in question.

Not all of society's objectives can be incorporated into the social prices that are used to evaluate project costs and benefits. For example,it may be a stated objective to reduce the disparity between regions of the country or to avoid a further influx of workers into the cities. Hence the analyst may be told to give a preference to projects that are located in the less developed regions or that will employ labour in rural areas. These and other similar objectives cannot readily be expressed in social prices. Such objectives are no less a legitimate concern of government than a desire to promote growth or reduce unemployment, even if it is beyond the scope of economics to place a value on such goals. Whether it is in society's interest to locate a project with a high social rate of profitability in a rural area where its financial profitability may be lower is a question that economics cannot answer definitively. However, project analysis can provide assistance in such non-quantifiable economic decision making. It is possible to estimate the net loss of economic benefit that will be incurred in meeting some non-quantifiable objective. For example, the net economic benefit of a project located in an urban area can be evaluated and compared to the net economic benefit that would accrue if the same project were located in a rural area. If there is a loss in net benefit by locating in a rural area, it remains for the decision maker to judge whether this loss is compensated for by the non-quantifiable benefits that society seeks. Without the information provided by project analysis, the decision maker would have no estimate of the costs that might be incurred in meeting some desirable but non-quantifiable social objective.

Apart from non-quantifiable social objectives, some projects have benefits that are difficult to value. The investment costs of education, health,and defence can be measured, but the benefits are less easily priced. Despite this, attempts are made to apply the usual cost benefit techniques to such investments and great ingenuity is shown by analysts measuring the benefits from an expansion of hospital services, agriculture extension, water purification programme, or the introduction of primary education. For example , the benefit from education are defined, in part, as the additional income that seems to be associated with increasing levels of education. Or for a medical project that will reduce mortality rates, the benefit may be the future saving by a person whose life is prolonged. In both cases, one has to make extremely strong assumptions about the behavior of the market, especially the market for labour services. Moreover, one has to believe that most of the benefits from better health or improved educational services or an increase in defence expenditures can be captured by measuring increased earnings. Although these assumptions lead to potentially useful analysis, we feel that more research is needed (and should be undertaken) before traditional cost-benefit analysis is used as a decision making tool for projects for which the output is a nebulous commodity whose benefits are

enjoyed by society as a whole. A more appropriate tool for resource allocation in such instances is programme budgeting and cost effectiveness analysis.

If the project is very large in relation to the economy, standard project appraisal is not applicable, at least not without major adjustments. Social and private prices are based on observation of an economy under existing conditions. Should the project itself be large enough to change those underlying conditions, the estimated prices will not be applicable after the project is implemented. Take, for example, a big steel project that is expected to increase export earnings by a substantial amount. The additional exchange earnings will lower the shadow exchange rate (and perhaps cause a revaluation of the official rate as well), which will affect virtually every economic activity in the country by making a scarce resource more abundant. Those secondary benefits are likely to be greater than the net benefits measured from the steel project alone, so a simple benefit-cost analysis will seriously under estimate the project's benefits. This is an extreme form of an external economy. Large power and irrigation dams, which may double electrical generating capacity and/or increase agricultural output dramatically, fall into the same category[4] or a project may be such a heavy user of electricity, or some other resource that it raises the price to all other users. In all such instances, the secondary costs may be greater than the costs of the project alone and the application of benefit-cost analysis is inappropriate.

The need to justify expenditures, especially of large projects, often forces analysts to apply appraisal tools, even inadequate ones. In such cases, the analyst can do a simple project appraisal but recognize that he may be seriously underestimating the net benefits or costs by ignoring linkage effects. Better, he can make some rough assessment of the net external impact of the project and try to include that in his appraisal. It is impossible to lay down any hard and fast rules for what are small or large projects. This will depend on the project in question and the country, or even region, where it is located. A project that may cause significant changes in small countries may cause barely a ripple in a big country. Only those familiar with the specific project and country can judge whether the tools of project analysis are appropriate in any particular case. As with many other aspects of project analysis, some feel for the technique and some understanding of the economy is essential.

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4. This does not mean that bigness is the same as profitability. Despite frequent claims by experts to the contrary, big dams and power projects may be very unprofitable socially. Careful analysis, including an analysis of potential external dis-economies or economies, is needed before deciding on any project.

STEPS IN PROJECT PREPARATION

The use of project analysis is likely to make possible a better allocation of resources and a higher level or output. But if the technique is to have a significant impact on economic performance, the principles of project analysis must be applied to all stages of project preparation. Too often the conceptual framework of social prices is used only at the final stage of project selection. Using social cost-benefit analysis for selecting projects to be included in the development (capital) budget or for deciding whether to give some incentives to a farmer will improve the allocation of scarce resources. But even greater improvement is possible if the theoretical constructs underlying social cost-benefit analysis are reflected at every stage of project preparation.

It is convenient to consider project preparation in three stages: project identification feasibility studies, and analysis. In practice, these steps may not be so distinct and some projects may not pass through these precise stages, but they can serve as a useful description of project preparation.

The identification of an investment opportunity may result from formal sector studies that try to pinpoint the investment requirements of a specific sector, or from an investor's search for agricultural or manufacturing activities that appear to offer opportunities for profitable investment. Such project identification does not provide a basis for allocation investment funds. At best it provides a guideline for further analysis and research. Although the identification of investment opportunities may be extremely broad at this stage, a possible misdirection of efforts may occur if the project identification studies are based purely on market prices, failing to take account of their divergence from social prices. Consider, for example, an economy that has an overvalued exchange rate and low tariffs on imports of rice. As a results, the market price of imported rice is well below the price that would reflect its true economic scarcity value and local growers may find it impossible to compete with imported rice. A layman of the economy might reach the conclusion that there is little scope for expansion of rice cultivation and thus fail to recommend it as a possible agricultural project. However, once it is recognized that the real cost of imported rice is higher than the prevailing market price, local rice production may become extremely profitable. (It is worth emphasizing that, if the government wishes to maintain a low rice price, for whatever reason,it is still free to do so and it can presumably give subsidy for local rice growers to achieve this objective.) It is easy to conceive of other examples where potential investment projects would be rejected or not even recognized in a project identification study because the analyst relied exclusively on market price.

A feasibility study is eventually required for an investment decision. Feasibility refers to an investigation of both technical possibility and economic viability. A feasibility study should bring

together engineers and other technical specialists, financial analysts and economists. It is at this stage that crucial decisions are taken that determine the eventual impact the project may have on the economy. The technical specialists will develop engineering designs that will minimize costs and study the technical parameters.. At this point the engineers should interact with the project analyst, though they rarely do.

Consider for example, an agriculturist studying a potential to develop a particular crop. While much of the technology for such cultivation is fixed, there are still production processes for which alternative methods are available. The packing of crop before transporting from the agricultural field for example, can be done by highly automated machines or by labourers cleaning, grading, and inserting it into a package. Both these methods are evaluated using market prices. If imported machinery bears a low duty and the exchange rate is overvalued, while there is a statutory minimum wage for workers, then the conclusion may be to design the project for automated folding and packing machines. As a consequence, the economy bent on saving foreign exchange and increasing employment opportunities will be faced with a project calling for large outlays of foreign exchange and creating few jobs. Yet if, while considering alternative ways of grading etc, the evaluation of such techniques had been done using social prices, the project analyst might have recommended a labour-intensive alternative.

The concept of labour-capital substitution often is greeted with skepticism. It is true that most manufacturing technologies are designed for the industrial countries and hence tend to be labour saving. But the failure to appraise engineering consultants and industrial designers with the prevailing social prices restricts the substitution possibilities even further. The engineer usually can be counted upon to design a project that will minimize market costs. Our objective is to minimize social costs. If social prices are made available, they can design a project to minimize such costs, thus ensuring a project more in line with national goals. If the project design reflects market prices, the application of social cost-benefit-benefit analysis can only help in selecting the least among the available projects offered. However, the opportunity to influence the design of the project itself would have been lost. Economists reviewing projects generally are in no position to suggest technical modifications for the simple reason that they are unaware of such alternative techniques. Thus, to exploit fully the substitution possibilities that exist among factors, it is essential that agriculturists and engineers work with social prices. Fortunately, there is a growing trend for agriculturists engineers to familiarize themselves with economic techniques and many are becoming aware of such concepts as social prices, recognizing their importance for project design in situations where a substantial divergence between social and market prices exists.

The final step in project preparation is the application of social cost-benefit analysis to select projects for the development budget or

for other form of government support. If more projects are submitted than can be implemented at one time, project analysis will ensure the selection of the projects most likely to maximize society's economic objectives. If, as is frequently the case, planners are considering only one project at a time, project analysis can screen out the least desirable and those that might retard an increase in welfare.

The estimation of social prices usually is subject to a considerable range of error. In addition, different assumptions about the causes of a divergence between market and social prices and the alternative means of estimating social prices from available data can lead to a number of substantially different estimates of social prices. Given a multiplicity of prices, each project analyst may feel free to choose the prices that will present his sector or his project in the best light. If one social wage rate does not make the project look very profitable, he may choose another. Of course, comparison between projects prepared by analysts using different social prices is meaningless. It makes no sense to compare an agricultural project with an industrial project if the underlying assumptions used in the social analysis of these projects differ. Thus it is crucial to ensure a broad consensus on the social prices and the general methodology to be employed. Such agreement is probably more important than seeking further methodological refinements in estimating shadow prices. Simple but consistent estimates of social prices, can help to improve resource allocation and their use is preferable to deciding without social appraisal.

Before turning to a description of the practical steps for measuring costs and benefits, a word of caution is in order. We have presented project analysis as a means of improving resource allocation in situations where for some reason market prices are judged to be inappropriate guides to real economic costs and benefits. Yet the use of social prices in such a situation carries its own problems. For example, a project may be included in the development budget because it has a high social return on investment. However, the project operates using market, not social prices. It buys its inputs and sells its output at market prices. We may find that a socially desirable project is unable to cover its operating costs evaluated at market prices and will require budgetary subventions. It will be difficult over the longer term for government to undertake socially desirable projects that, rather than generating a surplus, become a drain on the budget. In general, the wider the divergence between social and market prices, the more likely it is that this problem and others of a similar nature will arise. While social project analysis can help in improving resource allocation, it cannot, in the final analysis, substitute for sound macro economic policies that generate a set of market prices that reflect social objectives and economic costs and benefits.

NOTES

1. The net foreign exchange savings criterion is a crude and inappropriate application of the domestic resource cost calculation. The latter calculation is an appropriate economic tool for selecting among alternative activities. See, for example, Bela Balassa and Daniel M. Schydlowsky, "Effective Tariffs, Domestic Cost of Foreign Exchange, and the Equilibrium Exchange Rate," Journal of Political Economy 76 (May-June 1968).

2. The problem described can be solved by linear programming. For a simple description of linear programming, See William J. Baumol, Theory and Operation Analysis (Englewood Cliffs, N.J.: Prentice-Hall, 1965). A more comprehensive and technically complete description is given in Robert Dorfman, Paul A. Samuelson, and Robert M. Solow, Linear Programming and Economic Analysis (New York: McGraw-Hill, 1958).

3. A more powerful and comprehensive approach to this problem is risk analysis. Cf. Louis Y. Pouliquen, Risk Analysis in Project Appraisal (Washington, D.C.: International Bank for Reconstruction and Development, n.d.).

OUTLINE OF A TALK ON "PROJECT FORMULATION"

DR. P.V. SHENOI[1]

SYNOPSIS

1. Why project identification?

2. Four requisites for agricultural development:

   - Technology
   - Inputs
   - Price support
   - Processing & Marketing infrastructure

3. Institutional infrastructure for these four inputs.

4. Roles of (a) farmer, (b) private sector and

   (c) Govt. in building such infrastructure.

5. Pricing and subsidy policies in agricultural development for:

   - inputs and
   - produce.

6. Criteria for project identification:

   - efficiency
   - equity

7. Project Preparation - Need for comprehensive approach to identify all inputs and output & to deal with them.

8. Project Preparation - Timing & sequential considerations.

9. Elements in projectisation:

   - objectives
   - targets
   - strategies & activities
   - resources
   - accountability & participation
   - milestones
   - communication
   - distribution of benefits
   - concurrent evaluation

10. Conclusion.

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1. Additional Secretary, Ministry of Agriculture GOI.

IDENTIFYING PROJECT COSTS AND BENEFITS

WE UNDERTAKE ECONOMIC ANALYSES of agricultural projects to compare costs with benefits and determine which among alternative projects have an acceptable return. The costs and benefits of a proposed project therefore must be identified. Furthermore, once costs and benefits are known, they must be priced, and their economic values determined. All of this is obvious enough, but frequently it is tricky business.

What costs and benefits in agricultural projects are, and how we can define them in a consistent manner, are the topics of this chapter. In chapter 3 we will examine how we can obtain market prices. After the financial analysis are discussed in chapters 4-6 the economic analysis is addressed in chapter 7 with a discussion of how to adjust market prices to reflect the real resource flows.

OBJECTIVES, COSTS AND BENEFITS

In project analysis, the objectives of the analysis provide the standard which costs and benefits are defined. Simply put, a cost is anything that reduces an objectives, and a benefit is anything that contributes to an objective.

The problem with such simplicity, however, is that each participant in a project has many objectives. For a farmer, a major objective of participating is to maximize the amount his family has to live on. But this is only one of the farmer's interests. He may also want his children to be educated; as a result, they may not be available to work full time in the fields. he may also value his time away from the fields: a farmer will not adopted cropping pattern, however remunerative, that requires him to work ten hours a day 365 days a year. Taste preference may lead a farmer to continue to grow a traditional variety of rice for home consumption even though a new, high-yielding variety might increase his family income more. A farmer may wish to avoid risk, and so may plan his cropping pattern to limit the risk of crop failure to an acceptable level or to reduce the risk of his depending solely on the market for the food grains his family will consume. As a result, although he may be able to increase his income over time if he grows cotton instead of wheat or maize, he would rather continue growing food grains to forestall the possibility that in any one year the cotton crop might fail or that food grains might be available for purchase in the market only at a very high price. All these considerations affect a farmer's choice of cropping pattern and thus the income-generating capacity of the project. Yet all are sensible decisions in the farmer's view. In the analytical system presented here, we will try to identify the cropping pattern that we think the farmer will most probably select, and then we will judge the effects of that pattern on his incremental income and, thus, on the new income generated by the project.

For private business firms or government corporations, a major objective is to maximize net income, yet both have significant

objectives other than simply making the highest profit possible. Both will want to diversify their activities to reduce risk. The private store owner may have a preference for leisure, which leads him to hire a manager to help operate his store, especially during late hours. This reduces the income - since the manager must be paid a salary - but it is a sensible choice. For policy reasons, a public bus corporation may decide to maintain services even in less densely populated areas or at off-peak hours and there by reduce its net income. In the analytical system here, we first identify the operating pattern that the firms in the project will most likely follow and then build the accounts to assess the effects of that pattern on the income generating capacity of the project.

A society as a whole will have as a major objective increased national income, but it clearly will have many significant, additional objectives. One of the most important of these is income distribution. Another is simply to increase the number of productive job opportunities so that unemployment may be reduced - which may be different from the objective of income distribution itself. Yet another objective may be to increase the proportion of savings in any given period so there will be more to invest, faster growth, and, hence, more income in the future. Or, there may be issues to address broader than narrow economic considerations - such as the desire to increase regional integration, to upgrade the general level of education, to improve rural health, or to safeguard national security. Any of these objectives might lead to the choice of a project (or a form of a project) that is not the alternative that would contribute most to national income narrowly defined.

No formal analytical system for project analysis could possible take into account all the various objectives of every participant in a project. Some selection will have to be made. In the analytical system here, we will take as formal criteria very straightforward objectives of income maximization and accommodate other objectives at other points in the process of project selection. The justification for this is that in most developing countries increased income is probably the single most important objective of individual economic effort, and increased national income is probably the most important objective of national economic policy.

For farms, we will take as the objective maximizing the incremental net benefit - the increased amount the farm family has to live on as a result of participating in the project - derived as outlined in chapter 4. For a private business firm or corporation in the public sector, we will take as the objective maximizing the incremental net income, to which we will return in chapter 5. And for the economic analysis conducted from the standpoint of the society as a whole, we will take as the objective maximizing the contribution the project makes to the national income - the value of all final goods and services produced during a particular period, generally a year. This is virtually the same objective, except for minor formal variations in definition, as maximizing gross domestic product (GDP). It is important to emphasize that taking the income a project will contribute to a society as the

formal analytical criterion in economic analysis does not downgrade other objectives or preclude our considering them. Rather, we will simply treat consideration of other objectives as separate decisions. Using our analytical system, we can judge which among alternative projects or alternative forms of a particular project will make an acceptable contribution to national income. This will enable us to recommend to those who must make the investment decision a project that has a high income-generating potential and also will make a significant contribution to other social objectives. For example, from among those projects that make generally the same contribution to increased income, we can choose the one that has the most favourable effects on income distribution, or the one that creates the most jobs, or the one that is the most attractive among those in a disadvantaged region.

Thus, in the system of economic analysis discussed here, anything that reduces national income is a cost and anything that increases national income is a benefit. Since our objective is to increase the sum of all final goods and services, anything that directly reduces the total final goods and services is obviously a cost, and anything that directly increases them is clearly a benefit. But recall, also, the intricate workings of the economic system. When the project analyzed uses some intermediate good or service - something that is used to produce something else - by a chain of events it eventually reduces the total final goods and services available elsewhere in the economy. On the one hand, if we divert an orange that can be used for direct consumption - and thus is a final good - to the production of orange juice, also a final good, we are reducing the total available final goods and services, or national income, by the value of the orange and increasing it by the value of the orange juice. On the other hand, if we use cement to line an irrigation canal, we are not directly reducing the final goods and services available; instead, we are simply reducing the final goods and services available; instead, we are simply reducing the availability of an intermediate good. But the consequence of using the cement in the irrigation project is to shift the cement away from some other use in the economy. This, in turn, reduces production of some other good, and so on through the chain of events until, finally, the production of final goods and services, the national income, is reduced. Thus, using cement in the project is a cost to the economy. How much the national income will be reduced by using the cement for the project is part of what we must estimate when we turn, in chapter 7, to deriving economic values. On the benefit side, we have a similar pattern. Lining a canal increases available water that, in turn, may increase wheat production, and so on through a chain of events until in the and the total amount of bread is increased. By this mechanism, the project leads to an increase in the total amount of final good and services, which is to say it increases the national income. Again, part of the analyst's task in the economic analysis is to estimate the amount of this increase in national income available to the society; that is, to determine whether, and by how much, the benefits exceed the costs in terms of nation income.

If this rather simple definition of economic costs and benefits is

kept in mind, possible confusion will be avoided when shadow prices are used to value resource flows, a matter taken up in chapter 7.

Note that, by defining our objective for economic analysis in terms of change in national income, we are defining it in real terms. (Real terms, as opposed to money terms, refer to the physical, tangible characteristics of goods and services.) To an important degree, economic analysis, in contrast to financial analysis, consists in tracing the real resource flows induced by an investment rather than the investment's monetary effects.

With these objectives defined, we may then say that in financial analysis our numeraire - the common measurement used as the unit of account - is a unit of currency, generally domestic currency, whereas in economic analysis our numeraire is a unit of national income, generally also expressed in domestic currency.

In the economic analysis we will assume that all financing for a project comes from domestic sources and that all returns from the project go to domestic residents. (This is one reason why we identify our social objective with the gross domestic product (GDP) instead of the more familiar gross domestic product (GNP). This convention - almost universally accepted by project analysts - separates the decision of how good a project is in its income-generating potential from the decision of how to finance it. The actual terms of financing available for a particular project will not influence the evaluation. Instead, we will assume that the proposed project is the best investment possible and that financing will them be sought for it at the best terms obtainable. This convention serves well whenever financing can be used for a range of projects or even variations of roughly the same project. The only case in which it does not hold will is the rather extreme case in which foreign financing is very narrowly tied to a particular project and will be lost if the project is not implementing a lower-yielding project with foreign financing or choosing a higher-yielding alternative but losing the foreign loan. "With" and "Without" Comparisons

Project analysis tries to identify and value the costs and benefits that will arise with the proposed project and to compare then with the situation as it would be without the project. The difference is the incremental not benefit arising from the project investment. This approach is not the same as comparing the situation "before" and "after" the project. The before-and-after comparison fails to account for changes in production that would occur without the project and thus loads to an erroneous statement of the benefit attributable to the project investment.

A change in output without the project can take place in two kinds of situations. The most common is when production in to areas is already growing, if only slowly, and will probably continue to grow during the life of the project. The objective of the project is to

increase growth by intensifying production. In Syria at the time the First Livestock Development Project was apprised, for example, production in the national sheep flock was projected to grow at about 1 percent a year without the project. The project was to increase and stabilize sheep production and the incomes of semi-nomadic flock owners and sheep farmers by stabilizing the availability of feed and improving veterinary services. With the project, national flock production was projected to grow at the rate of a 3 percent a year. In this case, if the project analyst had simply compared the output before and after the project, he would have erroneously attributed the total increase in sheep production to the project investment. Actually, what can be attributed to the project investment is only the 2 percent incremental increase in production in excess of the 1 percent that would have occurred anyway.

A change in output can also occur without the project if production would actually fall in the absence of new investment. In Guyana, on the north coast of South America, rice and sugarcane are produced on a strip of clay and silt soil edging the sea. The coast was subject to erosion from wave action. Under the Sea Defense Project, the government of Guyana has built sea walls to prevent the erosion. The benefit from this project, then, is not increased production but avoiding the loss of agricultural output and sites for housing. A simple before-and-after comparison would fail to identify this benefit.

In some cases, an investment to avoid a loss might also lead to an increase in production, so that the total benefit would arise partly from the loss avoided and partly from increased production. In Pakistan, many areas are subject to progressive salinization as a result of heavy irrigation and the waterlogging that is in part attributable to seepage from irrigation canals. Capillary action brings the water to the surface where evaporation occurs, leaving the salt on the soil. If nothing is one to halt the process, crop production will fall. A project is proposed to line some of the canals, thus to reduce the seepage and permit better drainage between irrigations. The proposed project is expected to arrest salinization, to save for profitable use the irrigation water otherwise lost to seepage, and to help farmers increase their use of modern inputs. The combination of measures would not only avoid a loss but also lead to an increase in production. Again, a simple before-and-after comparison would fail to identify the benefit realized by avoiding the loss.

Of course, if no change in output is expected in the project areas without the project, then the distinction between the before-and-after comparison and the with-and-without comparison is less crucial. In some projects the prospects for increasing production without new investment are minimal. In the Kemubu Irrigation Project in northeastern Malaysia, a pump irrigation scheme was built that permitted farmers to produce a second rice crop during the dry season. Without the project, most of the second rice crop during the dry season. Without the project, most of the area was not likely to increase because of the limited amount of water available. With the project now in operation, rice is grown in

the dry season. Of course, the value of the second rice crop could not be taken as the total benefit from the project. From this value must be deducted the value forgone from the grazing and the production of cash crops. Only the incremental value could be attributed to the new investment in pumps and canals.

Another instance where there may be no change in output without the project is the obvious one found in some settlement project. Without the project there may be no economic use of the area at all. In the Al to Turi Land Settlement Project in northeastern Brazil, settlers established their holdings by clearing the forest, planting upland rice, and then establishing pasture for production of beef cattle. At the time the settlers took up their holdings the forest had not been economically exploited - nor was it likely to be, at lest for many years, in the absence of the project. In this case, the output without the project would be the same as the output before the project.

DIRECT TRANSFER PAYMENTS

Some entries in financial accounts really represent shifts in claims to goods and services from one entity in the society to another and do not reflect changes in national income. These are the so-called direct transfer payments, which are much easier to identify if our definition of costs and benefits is kept in mind. In agricultural project analysis four kinds of direct transfer payments are common: taxes, subsidies, loans, and debt service (the payment of interest and repayment of principal).

Take taxes, for example. In financial analysis a tax payment is clearly a cost. When a farmer pays a tax, his net benefit is reduced. But the farmer's payment of tax does not reduce the national income. Rather, it transfers income from the farmer to the government so that this income can be used for social purposes presumed to be more important to the society than the increased individual consumption (or investment) had the farmer retained the amount of the tax. Because payment of tax does not reduce national income, it is not a cost from the standpoint of the society as a whole. Thus, in economic analysis we would not treat the payment of taxes as a cost in project accounts. Taxes remain a part of the overall benefit stream of the project that contributes to the increase in national income.

Of course, no matter what form a tax takes, it is still a transfer payment - whether a direct tax on income or an indirect tax such as a sales tax, an excise tax, or a tariff or duty on an imported input for production. But some caution is advisable here. Taxes that are treated as a direct transfer payment are those representing a diversion of net benefit to the society. Quite often, however, government charges for goods supplied or services rendered may be called taxes. Water rates, for example, may be considered a tax by the farmer, but from the standpoint of the society as a whole they are a payment by the farmer to

the irrigation authority in exchange for water supplied. Since building the irrigation system reduces national income, the farmer's payment for the water is part of the cost of producing the crop, the same as any other payment for a production input. Other payments called taxes may also be payments for goods and services rendered rather than transfers to the government. A stevedoring charge at the port is not a tax but a payment for services and so would not be treated as a duty would be. Whether a tax should be treated as a transfer payment or as a payment for goods and services depends on whether the payment is a compensation for goods and services needed to carry out the project or merely a transfer, to be used for general social purposes, of some part of the benefit from the project to the society as a whole.

Subsidies are simply direct transfer payments that flow in the opposite direction from taxes. If a farmer is able to purchase fertilizer at a subsidized price, that will reduce his costs and thereby increase his net benefit, but the cost of the fertilizer in the use of the society's real resources remains the same. The resources needed to produce the fertilizer (or import it from abroad) reduce the national income available to the society. Hence, for economic analysis of a project we must enter the full cost of the fertilizer.

Again, it makes no difference what from the subsidy takes. One form is that which lowers the selling price of inputs below what otherwise would be their market price. But a subsidy can also operate to increase the amount the farmer receives for what he sells in the market, as in the case of a direct subsidy paid by the government that is added to what the farmer receives in the market. A more common means to achieve the same result does not involve direct subsidy. The market price may be maintained at a level higher than it otherwise would be by, say, levying an import duty on competing imports or forbidding competing imports altogether. Although it is not a direct subsidy, the difference between the higher controlled price set by such measures and the lower price for competing imports that would prevail without such measures does represent and indirect transfer from the consumer to the farmer.

Credit transactions are the other major form of direct transfer payment in agricultural projects. From the standpoint of the farmer, receipt of a loan increases the production resources he has available; payment of interest and repayment of principal reduce them. But from the standpoint of the economy, things look different. Does the loan reduce the national income available? No, it merely transfers the control over resources from the lender to the borrower. Perhaps one farmer makes the loan to his neighbor. The lending farmer cannot use the money he lends to buy fertilizer, but the borrowing farmer can. The use of the fertilizer, of course, is a cost to the society because it uses up resources and thus reduces the national income. But the loans transaction does not itself reduce the national income; it is, rather, a direct transfer payment. In reverse, the same thing happens when the farmer repays his loans. The farmer who borrowed cannot buy fertilizer

with the money he uses to repay the loan his neighbor made, but his neighbor can. Thus, the repayment is also a direct transfer payment.

Some people find the concept of transfer payments easier to understand if it is stated in terms of real resource flows. Taking this approach in economic analysis, we see that a tax does not represent a real resource flow; it represents only the transfer of a claim to real resource flows. The same holds true for a direct subsidy that represents the transfer of a claim to real resources from, say, an urban consumer to a farmer. This line of reasoning also applies to credit transactions. A loan represents the transfer of a claim to real resources from the lender to the borrower. When the borrower pays interest or repays the principal, he is transferring the claim to the real resources back to the lender - but neither the loan nor the repayment represents, in itself, use of the resources.

COSTS OF AGRICULTURAL PROJECTS

In almost all project analysis, costs are easier to identify (and value) than benefits. In every instance of examining costs, we will be asking ourselves if the item reduces the net benefit of a farms or the net income of a firm (our objectives in financial analysis), or the national income (our objective in economic analysis).

PHYSICAL GOODS

Rarely will physical goods used in an agricultural project be difficult to identify. For such goods as concrete for irrigation canals, fertilizer and pesticides for increasing production, or materials for the construction of homes in land settlement projects, it is not the identification that is difficult but the technical problems in planning and design associated with finding out how much labor.

Neither will the labor component of agricultural projects be difficult to identify. From the highly skilled project manager to the farmer maintaining his orchard while it is coming into production, the labor inputs raise less a question of what than of how much and when. Labor may, however, raise special valuation problems that call for the use of a shadow price. Confusion may also arise on occasion in valuing family labor. Valuing family labour should be included in farm budgets and the overall question of valuing unskilled labor should also be considered.

LAND

By the same reasoning, the land to be used for an agricultural project will not be difficult to identify. It generally is not

difficult to determine where the land necessary for the project will be located and how much will be used. Yet problems may arise in valuing land because of the very special kind of market conditions that exist when land is transferred from one owner to another. These valuation problems should also be considered with farm budgets and while determining economic values.

CONTINGENCY ALLOWANCES

In projects that involve a significant initial investment in civil works, the construction costs are generally estimated on the initial assumption that there will be no modifications in design that would necessitate changes in the physical work; no exceptional conditions such as unanticipated geological formations; and no adverse phenomena such as floods, landslides, or unusually bad weather. In general, project cost estimates also assume that there will be no relative changes in domestic or international prices and no inflation during the investment period. It would clearly be unrealistic to rest project cost estimates only on these assumptions of perfect knowledge and complete price stability. Sound project planning requires that provision be made in advance for possible adverse changes in physical conditions or prices that would add to the baseline costs. Contingency allowances are thus included as a regular part of the project cost estimates.

Contingency allowances may be divided into these that provide for physical contingencies and these for price contingencies. In turn, price contingency allowances combine two categories, these for relative changes in price and those for general inflation. Physical contingencies and price contingencies that provide for increases in relative costs underline our expectation that physical changes and relative price changes are likely to occur, even though we cannot forecast with confidence just how their influence will be felt. The increase in the use of real goods and services represented by the physical contingency allowance is a real cost and will reduce the final goods and services available for other purposes; that is, it will reduce the national income and, hence, is a cost to the society. Similarly, a rise in the relative cost of an item implies that its productivity elsewhere in the society has increased; that is, its potential contribution to national income has risen. A greater value is forgone by using the item for our project; hence, there is a larger reduction in national income. Physical contingency allowances and price contingency allowances for relative changes in price, then, are expected - if un-allocated project costs, and they properly form part of the cost base un-allocated - project costs, and they properly form part of the cost base when measures of project worth are calculated.

General inflation, however, poses a different problem. As we will not in chapter 3 in discussing future prices, in project analysis the most common means of dealing with inflation is to work in constant prices, on the assumption that all prices will be affected equally by any rise in the general price level. This permits valid comparisons

among alternative projects. If inflation is expected to be significant, however, provision for its effects on project cost needs to be make in the project financing plan so that an adequate budget is obtained. Contingency allowances for inflation would not, however, be included among the costs in project accounts other than the financing plan.

TAXES

Recall that the payment of taxes, including duties and tariffs, is customarily treated as a cost in financial analysis but as a transfer payment in economic analysis (since such payment does not reduce the national income). The amount that would be deducted for taxes in the financial accounts remains in the economic accounts as part of the incremental not benefit and, thus, part of the now income generated by the project.

DEBT SERVICE

The same approach applies to debt service - the payment of interest and the repayment of capital. Both are treated as an outflow in financial analysis. In economic analysis, however, they are considered transfer payments and are emitted from the economic accounts.

Treatment of interest during construction can give rise to confusion. Lending institutions sometimes add the value of interest during construction to the principal of the loan and do not require any interest payment until the project begins to operate and its revenues are flowing. This process is known as "capitalizing" interest. The amount added to the principal as a result of capitalizing interest during construction is similar to an additional loan. Capitalizing interest defers interest cost, but when the interest payments are actually due, they will, of course, be larger because the amount of the loan has been increased. From the standpoint of economic analysis, the treatment of interest during construction is clear. It is a direct transfer payment the same as any other interest payment, and it should be omitted from the economic accounts. Often interest during construction is simply added to the capital cost of the project. To obtain the economic value of the capital costs, the amount of the interest during construction must be subtracted from the capital cost and omitted from the economic account.

In economic analysis, debt service is treated as a transfer within the economy even if the project will actually be financed by a foreign loan and debt service will be paid abroad. This is because of the convention of assuming that all financing for a project will come from domestic sources and all returns from the project will go to domestic residents. This convention, as noted earlier, separates the decision of how good a project is from the decision of how to finance it. Hence, even if it were expected that project would be financed, say, by a World

Bank loan, the debt service on that loan would not appear as a cost in the economic accounts of the project analysis.

SUNK COSTS

Sunk cost are these costs incurred in the past upon which a proposed new investment will be based. Such costs cannot be avoided, however poorly advised they may have been. When we analyze a proposed investment, we consider only future returns to future costs; expenditures in the past, or sunk costs, do not appear in our accounts.

In practice, if a considerable amount has already been spent on a project, the future returns to the future costs of completing the project would probably be quite attractive even if it is clear in retrospect that the project should never have been begun. The ridiculous extreme is when only one dollar is needed to complete a project, even a rather poor one, and when no benefit can be realized until the project is completed. The "return" to that dollar may well be extremely high, and it would be clearly worthwhile to spend it. But the argument that because much has already been spend on a project, it therefore must be continued, is not a valid criterion for decision. There are cases in which it would be preferable simply to stop a project midway or to draw it to an early conclusion so that future resources might be freed for higher-yielding alternatives.

For evaluating past investment decisions, it is often desirable to do an economic and financial analysis of a completed project. Here, of course, the analyst would compare the return from all expenditures over the past life of the project with all returns. But this kind of analysis is useful only for determining the yield of past projects in the hope that judgments about future projects may be better informed. It does not help us decide what to do in the present. Money spent in the past is already gone; we do not have as one of our alternatives not to implement a completed project.

TANGIBLE BENEFITS OF AGRICULTURAL PROJECTS

Tangible benefits of agricultural projects can arise either from an increased value of production or from reduced costs. The specific forms in which tangible benefits appear, however, are not always obvious, and valuing them may be quite difficult.

INCREASED PRODUCTION

Increased physical production is the most common benefit of agricultural projects. An irrigation project permits better water control so that farmers can obtain higher yields. Young trees are

planted on cleared jungle land to increase the area devoted to growing oil palm. A credit project makes resources available for farmers to increase both their operating expenditures for current production - for a tubewell or a power thresher. The benefit is the increased production from the farm.

In a large proportion of agricultural projects the increased production will be marketed through commercial channels. In that case identifying the benefit and finding a market price will probably not prove too difficult, although there may be a probably not prove too difficult, although there may be a problem in determining the correct value to use in the economic analysis.

In many agricultural projects, however, the benefits may well include increased production consumed by the farm family itself. Such is the case in irrigation rehabilitation projects along the north coast of Java. The home-consumed production from the projects increased the farm families' net benefit and the national income just as much as if it had been sold in the market. Indeed, we could think of the hypothetical case of a farmer selling his output and then buying it back. Since home - consumed production contributes to projects objectives in the same way as marketed production, it is clearly part of the project benefits in both financial and economic analysis. Omitting home-consumed production will tend to make projects that produce commercial crops seem relatively high-yielding, and it could lead to a poor choice among alternative projects. Failure to include home-consumed production will also mean underestimating the return to agricultural investments relative to investments in other sectors of the economy.

When home-consumed crops will figure prominently in a project, the importance of careful financial analysis is increased. In this case, it is necessary to estimate not only the incremental net benefit - including the value of home-consumed production and money from off-farm sales - but also the cash available to the farmer. From the analysis of cash income and costs, one can determine if farmers will have the cash in hand to purchase modern inputs or to pay their credit obligations. It is possible to have a project in which home-consumed output increases enough for the return to the economy as a whole to be quite attractive, but in which so little of the increased production is sold that farmers will not have the cash to repay their loans.

QUALITY IMPROVEMENT

In some instances, the benefit from an agricultural project may taken the form of an improvement in the quality of the product. For example, the analysis for the Livestock Development Project in Ecuador, which was to extend loans to producers of beef cattle, assumed that ranchers would be able not only to increase their cattle production but also to improve the quality of their animals so that the average live price of steers per kilogram would rise from S/5.20 to S/6.40 in constant

value terms over the twelve-year development period. (The symbol for Ecuadorian sucres is S/.) Loans to small dairy farmers in the Rajasthan Small breeder Dairy Improvement Project in India are intended to enable farmers not only to increase output but also to improve the quality of their product. Instead of selling their milk to make ghee (cooking oil from clarified butter), farmers will be able to sell it for a higher price in the Jaipur fluid milk market. As in these examples, both increased production and quality improvement are most often expected production and quality improvement are most often expected in agricultural projects, although both may not always be expected. One word of warning: both the rate and the extent of the benefit from quality improvement can easily be overstated.

CHANGE IN TIME OF SALE

In some agricultural project, benefits will arise from improved marketing facilities that allow the product to be sold at a time when prices are more favourable. A grain storage project may make it possible to hold grain from the harvest period, when the price is at its seasonal low, until later in the year when the price has risen. The benefit of the storage investment arises out of this change in "temporal value".

CHANGE IN LOCATION OF SALE

Other projects may include investment in trucks and other transport equipment to carry products from the local area where prices are low to distant markets where prices are higher. For example, the Fruit and Vegetable Export Project in Turkey included provision for trucks and lorries to transport fresh produce from southeastern Turkey to out-lets in the European Common Market. The benefit of such projects arise from the change in "locational value."

In most cases the increased value arising from marketing projects will be split between farmers and marketing firms as the forces of supply and demand increases the price at which the farmer can sell in the harvest season and reduce the monopolistic power of the marketing firm or agency. Many projects are structured to ensure that farmers receive a larger part of the benefit by making it possible for them to build storage facilities on their farms or to band together into cooperatives, but an agricultural project could also involve a private marketing firm or a government agency, in which case much of the benefit could accrue to someone other than farmers.

CHANGES IN PRODUCT FORM (Grading and Processing)

Projects involving agricultural processing industries expect benefits to arise from a change in the form of the agricultural product.

Farmers soil paddy rice to millers who, in turn, sell polished rice. The benefit to the millers arises from the change in form. Canners preserve fruit, changing its form and making it possible at a lower cost to change its time or location of sale. Even a simple processing facility such as a grading shed gives rise to a benefit through changing the form of the product from run-of-the-orchard to sorted fruit. In the Himachal Pradesh Apple Marketing Project in northern India, the value of the apples farmers produce is increased by sorting; the best fruit is sold for fresh consumption while fruit of poorer quality is used to make a soft drink concentrate. In the process, the total value of the apples is increased.

COST REDUCTION THROUGH MECHANIZATION

The classic example of a benefit arising from cost reduction in agricultural projects is that gained by investment in agricultural machinery to reduce labor costs. Examples are tubewells substituting for hand-drawn or animal-drawn water, pedal threshers replacing hand threshing, or (that favoured example) tractors replacing draft animals. Total production may not increase, but a benefit arises because the costs have been trimmed (provided, of course, that the gain is not offset by displaced labor that cannot be productively employed elsewhere).

REDUCED TRANSPORT COSTS

Cost reduction is a common source of benefit wherever transport is a factor. Better feeder roads or highways may reduce the cost of moving produce from the farm to the consumer. The benefit realized may be distributed among farmers, truckers, and consumers.

LOSSES AVOIDED

In discussing with-and-without comparisons in project analyses earlier in this chapter, we noted that in some projects the benefit may arise not from increased production but from a loss avoided. This kind of benefit stream is not always obvious, but it is one that the with-and-without test tends to point out clearly. In Jamaica, lethal yellowing as attacking the Jamaica Tall variety of coconut. The Government has undertaken a large investment to enable to plant Malayan Dwarf coconuts, which are resistant to the disease. Total production will change very little as a result of the investment, yet both the farmer and the economy will realize a real benefit because the new investment prevents loss of income. The Lower Egypt Drainage Project involves the largest single tile drainage system in the world. The benefit will arise not from increasing production in the already highly productive Nile delta, but from avoiding losses due to the waterlogging caused by year-round irrigation from the Aswan High Dam.

Sometimes a project increases output through avoiding loss - a kind of double classification, but one that in practice causes not problem. Proposals to eradicate foot-and-mouth disease in Latin America envision projects by which the poor physical condition or outright death of animals will be avoided. At the same time, of course, beef production would be increased.

OTHER KINDS OF TANGIBLE BENEFITS

Although we have touched on the most common kinds of benefits from agricultural projects these concerned with agricultural development will find other kinds of tangible, direct benefits most often in sectors other than agriculture. Transport projects are often very important for agriculture development. Benefits may arise not only from cost reduction, as noted earlier, but also from time savings, accident reduction, or development activities in areas newly accessible to markets. If new housing for farmers has been included among the costs of a project, as is often the case in land settlement and irrigation projects, then among the benefits will be an allowance for the rental value of the housing. Since this is an imputed value, there are valuation problems that will be noted later.

SECONDARY COSTS AND BENEFITS

Projects can lead to benefits created or costs incurred outside the project itself. Economic analysis must take account of these external, or secondary, costs and benefits so they can be properly attributed to the project investment. (Of course, this applies only in economic analysis; the problem does not arise in financial analysis).

When market prices are used in economic analysis, as has been the custom in the United States for water resources and other public works projects, it is necessary to estimate the secondary costs and benefits and then add them to the direct costs and benefits. This is a theoretically difficult process, and one easily subject to abuse. There is an extensive and complex literature on secondary costs and benefits that specifically addresses this analytical approach. For those who would like to review this literature, a good place to begin is the article by Prest and Turvey (1966), which outlines the historical development of the discussion. A highly technical review of the arguments can be found in Mishan (1971).

Instead of adding on secondary costs and benefits, one can either adjust the values used in economic analysis or incorporate the secondary cost and benefits in the analysis, thereby in effect converting them to direct costs and benefits. This is the approach taken in most project analyses carried out by international agencies, in the systems based on shadow prices proposed in more recent literature on project analysis, and in the analytical system presented here.

Incorporating secondary costs or benefits in project analysis can be viewed as an analytical device to account for the value added that arises outside the project but is a result of the project investment. In the analytical system here, every item is valued either at its opportunity cost or at a value determined by a consumer's willingness to pay for the item. The effect is to eliminate all transfers - both the direct transfers and the indirect transfers that arise because prices differ from opportunity costs. This means we attribute to the project investment all the value added that arises from it anywhere in the society. Hence, it is not necessary to add on the secondary costs and benefits separately; to do so would constitute double counting.

One qualification must be made. If a project has a substantial effect on the quantity other producers are able to sell in imperfect markets - and most markets are imperfect - there may be gains or losses not accurately accounted for. Squire and van der Tak (1975, p.23) cite the example of an improved road that diverts traffic (in avoiding the a social losses previously incurred on this traffic) in addition to the benefits to the road users measured directly. In agricultural projects, this is a rather infrequent case because prices generally are more flexible than a other sectors of the economy. In any event, in the practice of contemporary project analysis the size of these gains or losses is generally assumed to be insignificant, and no provision is made for them in the analysis.

Although shadow prices based on opportunity costs or willingness to pay directly reduces the difficulty of dealing with secondary costs and benefits, there still remain many valuation problems related to goods and services not commonly traded in competitive markets. One way to avoid some of these problems is to treat a group of closely related investments as a single project. For example, it is common to consider the output of irrigation project as the increased farm production, since valuing irrigation water is difficult. Another example is found in development roads built into inaccessible areas. It is argued that the production arising from the induced investment activities of otherwise unemployed now settlers should be considered a secondary benefit of the road investment. One way of avoiding the problem is to view this case as a land settlement project in which the road is a component. New production is then properly included among the direct benefits of the project and can be included in the project accounts at market or shadow prices, and no attempt need be made to allocate the benefits between road investment and the other kinds of investment that must be made by settlers and government if settlement is so succeed.

Another group of secondary costs and benefits has been called "technological spillover" or"technological externalities". Adverse ecological effects are a common example, and the side effects of irrigation development are often cited as an illustration. A dam may reduce river flow and lead to increased costs for dredging dewnstream. New tubewell development may have adverse effects on the flow of existing wells. Irrigation development may reduce the catch of fish or may lead to the spread of schistosomiasis. When these technological

externalities are significant and can be identified and valued, they should be treated as a direct cost of the project (as might be the case for reduced fish catches), or the cost of avoiding them should be included among the project costs (as would be the case for increased dredging or for investment to avoid pollution).

It is sometimes suggested that project investments may give rise to secondary benefits through a "multiplier effect". The concept of the multiplier is generally thought of in connection with economies having excess capacity. If excess capacity exists, an initial investment might cause additional increases in income as successive rounds of spending reduce excess capacity. In developing countries, however, it is shortage of capacity that is characteristic. Thus, there is little likelihood of excess capacity giving rise to additional benefits through the multiplier. In any event, most of the multiplier effect is accounted for if we shadow-price at opportunity cost. Since the opportunity cost of using excess involved, only variable costs will enter the project accounts until existing excess capacity is used up.

It is also sometimes suggested that there is a "consumption multiplier effect" as project benefits are received by consumers. Consumption multipliers are very difficult to identify and value. In any case, they presumably would be much the same for alternative investments, so omitting them from a project analysis would not effect the relative ranking of projects.

INTANGIBLE COSTS AND BENEFITS

Almost every agricultural project has costs and benefits that are intangible. These may include creation of new job opportunities, better health and reduced infant mortality as a result of more rural clinics, better nutrition, reduced incidence of waterborne disease as a result of improved rural water supplies, national integration, or even national defense. Such intangible benefits are real and reflect true values. They do not, however, lend themselves to valuation. How does one derive a figure for the long-term value of a child's life saved, or for the increased comfort of a population spared preventable, debilitating disease? Benefits of this kind may require a modification of the normal benefit-cost analysis to a least-cost type of analysis, a topic we will take up when we discuss evaluation. Because intangible benefits are a factor in project selection, it is important that they be carefully identified and, where at all possible, quantified, even though valuation is impossible. For example, how many children will enroll in now schools? How many homes will benefit from a better system of water supply? How many infants will be saved because of more rural clinics?

In most cases of intangible benefits arising from an agricultural project, the costs are tangible enough: construction costs for schools, salaries for nurses in a public health system, pipes for rural water supplies, and the like. Intangible costs, however, do exist in projects.

Such costs might be incurred if new projects disrupt traditional patterns of family life, if development leads to increased pollution, if the ecological balance is upset, or if scenic values are lost. Again, although valuation is impossible, intangible costs should be carefully identified and if possible quantified. In the end, every project decision will have to take intangible factors into account through a subjective evaluation because intangible costs can be significant and because intangible benefits can make an important contribution to many of the objectives of rural development.

DISCOUNTING TECHNIQUES

S. SAROJA

COMPARISON OVER TIME

If some one offers a choice between receiving Rs.100 today or receiving RS.100, five years hence, the decision would be clear. To get the money immediately and deposit in a saving account and earn 12% interest, which would give Rs. 176 in five years, If you are willing to take, risks and invest in business, you may earn much more. This is an illustration of time value of money or the cost of waiting. Money received today is always worth much more than the same money received in the future.

The same is true of the economy also. Resources available to the country this year can be invested to produce goods and services over the next several years. If those same resources are available only five years later, the economy would lose the benefit of that output for the next five years.

Thus in both private and social project appraisals it is necessary to account for the cost of waiting. Benefits and costs accruing earlier are valued more than the benefits and costs accruing later. Just as one cannot meaningfully add kilograms of sugar and meters of cloth, one cannot meaningfully add costs or benefits of 1981 to costs or benefits of 1986.

The process of weighing cash flows according to the year in which they occur is called discounting. The percentage difference between the value of one hundred rupees now and its value a year later from now is called the discount rate. Further costs and benefits are expressed and compared in terms of present value or present worth.

Let us assume that we invest Rs. 200 at an interest rate of 10 per cent per year. Then after 2 years it will yield Rs. $200\ (1+1/10)^2 = 242$. Now looking from the other angle, if we want to have Rs. 242 in hand two years from now, how much must be deposited today? The answer is Rs. $242/(1+1/10)^2$ = Rs. 200. Thus Rs. 200 is the present value of Rs. 242 (2 years hence) at 10% discount rate. If we assume that Rs. 242 is only available after 3 years, then the present value at 10% discount rate will be $242/(1+0.10)^3$ = Rs. 181.81, which is less than the present value Rs. 200, in 2 years time.

Let us now assume that the discount rate as 5%. Then the present value of Rs. 242 in two years would be $242/(1.05)^2$ = Rs. 220 which is greater than the present value at 10% discount rate.

These simple calculations prove the three important features of present value.

1. The present value is always less than the nominal value that occurs in the future.

2. The longer the delay, the less is the present value.

3. The higher the interest rate, the lower the present value.

This really means that waiting has a cost and the longer you wait, the larger the cost. The third point proves that if money and other assets are more productive, as reflected in the higher discount rate, the waiting is costlier. This raises the question as to which interest rate should be used in project appraisal. Generally the discount rate should reflect the cost of capital to the investor. Measurement of this cost to the society is a complex exercise, beyond the scope of the present objective.

Once future benefits and costs have been expressed in terms of present values, we add them to find out the Net Present Value (NPV) of the project. The general formulae is :

$$NPV = \frac{B_0 - C_0}{(1+i)^0} + \frac{B_1 - C_1}{(1+i)^1} + \frac{B_2 - C_2}{(1+i)^2} + \frac{B_t - C_t}{(1+i)^t} + \ldots\ldots + \frac{B_n - C_n}{(1+i)^n}$$

Where B is the benefit, C is the total cost and $B_t - C_t$ is net benefit in the year t, i is the discount interest rate, n is the number of years of duration of the project.

Example:- To use and interpret the NPV correctly, it is helpful to visualize a simple model of the discounting process (Table I).

It is seen that in the first two years, the outflow is higher and that there is no benefit. The formal selection criterion for the net present value of project is to accept all projects with a positive net present value when discounted at the opportunity cost of capital. If the NPV had been negative, then the project could not afford to borrow the money at the opportunity cost of capital. A positive NPV means that the investor will be able to repay the loan and still have some profit-equal to the NPV left over. But if the NPV is negative, the project should not be undertaken.

TABLE I EARTH FILL DAM SMALL-SCALE IRRIGATION PROJECT

S.NO	Capital	Operation Maintenance Costs	Production Costs	Total Costs	Total Value of benefits	Incrementel benefit Net Cash flow	D.F. 12%	N.P.V.
(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)
1.	7500	--	0	7500	0	-7500	.893	-6698
2.	6000	--	0	6000	0	-6000	.797	-4782
3.	--	600	700	1300	6000	+4700	.712	+3346
4.	--	600	700	1300	6000	+4700	.636	+2989
5.	--	600	700	1300	6000	+4700	.567	+2665
6.	--	600	700	1300	6000	+4700	.507	+2383
7.	--	600	700	1300	6000	+ 331	.452	+2124
					331*	+ 331	.452	+ 150
Total	13500	3000	3500	20,000	30,331			+2177

NPV at 12% = 2177

Benefit Cost Ratio = 17394/15217 = 1.1

* Salvage Value.

The important factor to note about these calculations is this: The discount procedure automatically allows for (1) compound interest payments at the rate of discount (2) recovery of capital over the project period. Therefore, this reinforces the point that it is wrong to include interest payments, principal repayments, or depreciation as part of cost outflow, as they are automatically accounted for.

COMPARISONS AMONG PROJECTS

Once a project has been fully analyzed and all its costs and benefits are expressed in present value, the analyst has to decide whether the project should be recommended for implementation. Because resources are limited and other projects are likely to be competing for

the same resources, it is necessary to make comparison among projects in order to decide.

1. PAY-OUT PERIOD

Pay out period is very simple but unfortunately can give misleading results, especially if the decision is being made by a government, a large corporation, or any entity with an expectation of long life. In a simple, incorrect form often used, the pay-out period measures the number of years it will take for the net undiscounted benefits to repay the investment. If the payout period is longer than some arbitrary limit, say five years, the project is rejected. If shorter, it is accepted. A more sophisticated version will use discounted net benefits, with the decision rule that NPV must become positive within a stated period.

Therefore the benefits accruing after the stated period are neglected. Even though future is always uncertain, it is improper to disregard benefits of later years as negligible. The discounting process itself places a lower value on future benefits. The pay-out-period criterion may be justifiable from the individual's point of view in the short run, but certainly for a nation, to disregard future benefits will lead to disaster. The crucial draw back is that it rejects all projects whose benefits take long time to materialize and favours only good short-term prospects. There is no reason to believe that all quick yielding projects are superior projects. Had it been used, there would have been no hydro electric power or railways.

EXAMPLE (Table II)

Projects A and B both require initial outlays of Rs. 1000. Whereas project A has higher net benefits in the first five years (Rs. 300 a year versus Rs. 200), project B does better from years 6-10 (Rs. 150 for A versus Rs. 500 for B). Discounting at 15% project A passes the five year pay-out test, with a total discounted benefits of Rs. 1006. Project B, with a total discounted benefits of Rs. 660, fails the test and is rejected. However, in the years 6-10, project B is much superior to A and after ten years its total discounted benefits are greater than those for project A (Rs. 1256 for A versus Rs. 1504 for B). By using pay out period we would have rejected project B.

BENEFIT COST RATIO

Benefit Cost Ratio was the most popular criterion in Social project appraisals for some time. It is calculated by dividing the total discounted benefits by total discounted costs. The project is accepted if the B.C. ratio is above 1.0, and projects with the highest ratios were given higher ranking. This criterion has severe shortcomings. It

TABLE II

Year	Net Cash Flows A	Net Cash Flows B	P. Value (15 %) A	P. Value (15 %) B
0	-1000	-1000	-1000	-1000
1	300	200	261	174
2	300	200	227	151
3	300	200	197	131
4	300	200	172	114
5	300	200	149	99
Total (years 1 to 5)			1006	669
6	150	500	65	217
7	150	500	56	188
8	150	500	49	164
9	150	500	43	142
10	150	500	37	124
Total (Years 1-10)			1256	1504

is often misleading when project sizes vary, giving a more favourable ratio to smaller projects*. The example below gives the discounted costs and benefits of two alternative projects, out of which only one can be implemented. Both the projects have a B-C ratio greater than one. Since

EXAMPLE (Table III)

TABLE III. CHOOSING BETWEEN ALTERNATIVES

Example:	Project A (a) Cost	Project A (a) Benefits	Project B (b) (discounted at 15%) Cost	Project B (b) (discounted at 15%) Benefits
0	1000	0	600	0
1	350	780	220	520
2	300	680	190	450
3	260	590	160	390
4	230	510	140	340
5	200	450	120	300
Total	2340	3010	1430	2000
NPV		670		570
Benefit/Cost Ratio		1.29		1.40

(a) Annual Cost Rs. 400; benefit Rs. 900
(b) Annual Cost Rs. 250; benefit Rs. 600

project B has a B-C ratio of 1.4, it will get a priority over project A. But if we analyse the incremental costs and benefits the outcome is different.

That Project A costs Rs. 910 more than project B and it would yield Rs. 1010 as extra benefits. Thus the incremental B.C. ratio is 1.11 (1010/900). Since each additional rupee spent will yield more benefits, it would be worthwhile to undertake project A rather than B even though the B.C. ratio is lower. NPV of A is Rs. 670 while that of B is only Rs. 570. The B.C. ratio criterion would lead to select project B, not because it is a better alternative, but because it is smaller.

Another problem with B.C. ratio is that it will give different answers depending on how costs and benefits are aggregated or classified. Arbitrary decisions about netting of costs and benefits will affect the Benefit Cost ratio. It should be seen that project decisions do not depend upon the quirks of accounting since B.C. ratio gives arbitrary and misleading results. They should not be used as the only project selection criterion.

3. NET PRESENT VALUE

The methodology for calculating NPV has been discussed earlier. In a situation faced by most governments with several potential projects and a limited capital budget, NPV criterion can be used for project ranking and selection. The interest rate reflecting the cost of capital is used for discounting costs and benefits. Then the projects with positive net present value are ranked, those with the higher NPV coming first. The projects are selected for implementation until the budget is exhausted.

Let us see the following example (Table IV).

The total capital budget is Rs. 3000. By selecting the first six projects, we exhaust our budget and have selected the most profitable set of investments. For example if we had used the B.C. ratio, we would have selected project H and dropped project D, causing a fall in total NPV from Rs. 2290 to Rs. 2090. Unfortunately, this method is also not infallible. For example, consider a project with an investment of 250, and net discounted benefits of 360 and net present value of 110, along with project H. Then the two together would have a total investment of Rs. 280, and NPV of Rs. 260. This would be sufficient to displace project F, and increase the total NPV by Rs. 10, and the investment cost by Rs. 20. This proves that the NPV selection method must also search the excluded projects to find better combinations that could change the ranking order, without increasing the budgetary limit.

TABLE IV CAPITAL - LIMITING FACTOR

Project	Investment Cost	Net Discounted Benefits	Net Present Value	B.C. ratio
A	500	1000	500	2.00
B	20	510	490	25.50
C	700	1100	400	1.57
D	1000	1350	350	1.35
E	480	780	300	1.625
F	300	550	250	1.833
Total	3000	5290	2290	
G	2000	2180	180	1.09
H	30	180	150	6.0
I	500	500	0	1.0

But when investment decisions are made adhocly without any reference to total capital budget, the NPV method can be employed' to ensure that the investment is productive enough to pay for the cost of capital and repay the investment costs. If the discount rate is equal to the cost of capital, then projects with positive NPV should be implemented.

When we talk of situations where the analyst has to decide about one of the alternatives, the project with a higher NPV should be chosen.

4. INTERNAL RATE OF RETURN

Although the net present value criterion should be employed in all situations, it is also useful to calculate the Internal Rate of Return (IRR). IRR is the discount rate at which the NPV is equal to zero. This measure is practically used for all economic and financial analyses of projects by the international financing agencies. When the internal rate of return is used in economic analysis, it is called internal economic rate of return (ERR); on the financial analysis it is called (IRR). In calculating the NPV, we independently chose a discount rate based on the opportunity cost of capital and then found the difference between discounted benefits and costs. The IRR calculation reverses the procedure. Instead of selecting the discount rate, we set the NPV at

zero and try to solve for the discount rate, which gives result. Since higher discount rates reduce the present value of future cash flows, the higher the discount rate, the lower the NPV. The process of finding the IRR involves trial and error. An arbitrary discount rate is used to find NPV. If the result is positive, a higher rate is used to find the NPV; if negative, a lower rate is used; and the process is repeated until the NPV is reduced to zero. At this discount rate, Benefit Cost Ratio is equal to one.

In the example of Table 1, let us discount at 18% instead of 12%.

TABLE V

Year	P. Value Total Costs	P. Value Total Benefits	Net Cash Flow	DF 18%	NPV
1	6352	0	-7500	.847	-6352
2	4308	0	-6000	.718	-4308
3	792	3654	+4700	.609	+2862
4	671	3096	+4700	.516	+2425
5	568	2622	+4700	.437	+2054
6	481	2220	+4700	.370	+1739
7	408	1884	+331	.314	+1476
8	--	104	---	.314	+104
Total	13580	13580		NPV	= 0

Benefit Cost Ratio = 13580/13580 = 1.0

It is seen that at a discount rate of 18%, the project just breaks even. In reality, IRR is a measure of profitability of the project. Higher the rate the more attractive the project. In this respect it is like the pay-out period and benefit cost ratio, since they also measure the attractiveness. Like the other two measures, this also ignores the total size of the project since small projects may have higher IRR. The formal selection criterion for the internal rate of return is to accept all projects having an IRR greater than the opportunity cost of capital. Projects are ranked in order of the value of the IRR.

STEP 1. First discount the cash flow at the cost of capital. If the NPV is negative, we know the project cannot pay such a high rate of

interest . It means that we have chosen a high discount rate. Now, choose a discount rate (lower rate) which will give a positive NPV. If in the first step, NPV is positive we should choose a new discount rate (higher), which will decrease the NPV and make it negative.

The real IRR lies between these two rates, and we can successively narrow down the limits. Now we use interpolation to estimate the true value of IRR.

$$\text{IRR} = \text{Lower discount rate} + \left(\text{Difference between the discount rate}\right) \times \frac{(\text{NPV at lower discount rate})}{(\text{Difference between the two NPVs})}.$$

It is very important to note that interpolation should not be carried out between a wider spread of discount rates (not more than five percent) since interpolation is a linear algebraic technique and the changes in IRR, NPV do not follow this pattern. In reality, the IRR follows a concave curvilinear function. The error in IRR should be rectified by actual verification and by narrowing down the limits between the two discount rates.

Another important assumption of the IRR technique is that it assumes implicitly that all the returns from the project are reinvested at the IRR, which is not really the case. Returns withdrawn from the project may be reinvested at any other rate or consumed.

Under certain circumstances IRR gives more than one solution; such situations generally do not arise in agricultural projects. Such situations arise only when recessions follow a period of positive net cash inflows. This leads first to a period of positive NPV and then to a period of negative NPV. Therefore, there will be two points at which NPV will be equal to zero (Table VI).

DEPRECIATION

Till now we have not included depreciation as a cost. Depreciation is a return of capital, while IRR is a measure of the earning capacity - that is - return to capital. Let us take the example of a project which neither loses money nor makes money, where NPV = 0; B.C ratio = 1.0 and IRR is equal to zero (Table VII).

The important question is, did we get our money back. The answer is yes. We spent Rs. 1,200 over a period of 5 years and by the end of the 5th year we have received exactly the same amount. We recovered all our investment and costs.

EXAMPLE

TABLE VI

Years	Net Benefit	20% PV	25% PV	40% PV	45.% PV
1-4	+50	+129	118	+92	+86
5	-750	-302	-246	-140	-117
6-20	+100	+188	+126	+46	+34
		+15	-2	-2	+3

TABLE VII

Year	Capital Costs	Production Costs	Total Costs	Total Benefits	Net Benefits	D.F. 0 %	P.V.
1	1000	0	1000	0	-1000	1.0	-1000
2	--	50	50	300	+250	1.0	+250
3	--	50	50	300	+250	1.0	+250
4	--	50	50	300	+250	1.0	+250
5	--	50	50	300	+250	1.0	+250
Total	1000	200	1200	1200	0		0

Did we earn anything? No. both IRR and NPV of this project were zero. The B.C. ratio at zero discount rate is 1.0.

Therefore return of capital is realized (depreciation is covered fully) when a project earns an IRR of zero or greater, when the NPV at zero discount rate is zero or greater, and when the B.C. ratio is one or greater at zero discount rate.

Therefore it is seen that we do not need to include depreciation as a cost in our analysis. It is automatically taken care of. Therefore, we are able to judge the project, independent of the arbitrary situations faced due to different methods of depreciation which is basically an accounting convention.

Of course, if IRR is less than zero, if the NPV at zero discount rate is negative or if the B.C. ratio at zero discount rate is less than one, then we would not have recovered all our costs.

SENSITIVITY ANALYSES

One of the real advantages of economic and financial analyses of the project is that it can be used to test what happens if something goes wrong. How sensitive is the project's ERR or IRR to increased costs? To a delay in output? To a fall in prices? The analysis is done with different cash flows and this is called sensitivity analysis. Since the project cash flows are projected (estimated) data, there is a high degree of uncertainty about its reality, and risk has to be analysed.

In agricultural projects, there are four main general kinds of sensitivity analyses which should be considered. They are different price situations, delays in implementation due to land settlement problems and farmer's attitudes, costs overruns and error in yield estimates since most of the output depends on monsoon, extension services and cropping patterns. With reference to agricultural projects adverse phenomena like floods, landslides, earthquakes, unusual bad weather, or unanticipated underground geology can change the fate of the total project. However, contingency allowances may be provided in the project itself, for possible situations, which are of manageable nature.

Inflation is a different problem. Most common method is to deal with inflation is to assume that all prices are affected equally and the IRR or ERR is calculated on the assumption of constant prices. But sound project planning requires that the effect of inflation on project costs should be provided since finances would not be adequate to cover the investment costs and operating costs. Therefore both costs and returns may be increased by the amount of anticipated inflation.

REPLACEMENT COSTS

Many agricultural projects require investments which have different lives. For example, in a pump irrigation scheme, the construction may last for thirty years but the pumps may last only for 10 years. Therefore in the analysis, allowance must be made for the replacement costs of the pumps during the life of the project.

SALVAGE VALUE

At the end of the project, there may be some salvage value which should be treated as benefit during the last year of the project.

SUNK COSTS

Sunk Costs should not affect our choice, since they have already been expended. Future costs and future benefits are the basis of our decision. The purpose of the economic and financial analysis is to help us to determine the best choice among the available alternatives. It does not deal with the amount already spent. Expenditures in the past, the sunk costs, do not affect our choice.

MUTUALLY EXCLUSIVE PROJECTS

When mutually exclusive alternatives are available, we have to discount the differences in the cash flows. This will give us the internal economic or financial rate of return to the incremental investment necessary to undertake the larger alternative. We can then compare this incremental rate of return with the cut-off rate, or with the opportunity cost of capital.

CHOICE BETWEEN TECHNOLOGY (Cross Over Discount Rate)

Discounting the differences between the two total <u>cost</u> streams (not cash inflows, can be used (to supplement an economic or financial analysis) to choose the minimum cost alternative when it is difficult to quantify the benefits. We may want to choose between two technologies viz., one with high capital costs and low operating costs and the other with low capital costs and high operating costs. In such a case, we will choose the alternative with a lower present value. However with different shapes of cost streams, the technology with lower present value may be different with different discount rates. So the ultimate choice will depend upon the cut off rate or opportunity cost of capital. At a particular discount rate, the pair of alternatives may have the same present worth and it is called the point of indifference or the cross over point.

Let us see the example in Table VIII. We have two technologies T_1 and T_2, where T_1 is manual and T_2 is mechanical technology for land development.

The equalizing discounting rate can be found either by discounting the differences between the cost streams or graphically. The point of indifference is between 10 per cent and 15 per cent. If the cost of capital or cut off rate is lower than the crossover rate, the alternative with the higher capital costs and lower operating costs (technology 2) should be preferred; but if it is greater than the crossover point, the technology with lower capital costs and higher operating costs should be preferred. (Graph 1).

EXAMPLE

TABLE VIII LAND DEVELOPMENT (T_1 MANUAL) Vs (T_2 MECHANICAL)

Year	Costs T_1	Costs T_2	10% T_1	10% T_2	15% T_1	15% T_2
1	47850	112286	--	102068	--	97689
2	47850	25134	--	20761	--	19001
3	47850	25130	181399	17913	160393	16538
4	47850	26227		16287		15002
5	47850	26227		--		13035
Total			181399	17590	160393	161265

In order to find the cross-over rate, we will have to discount the differences in the two cost streams. (Table IX)

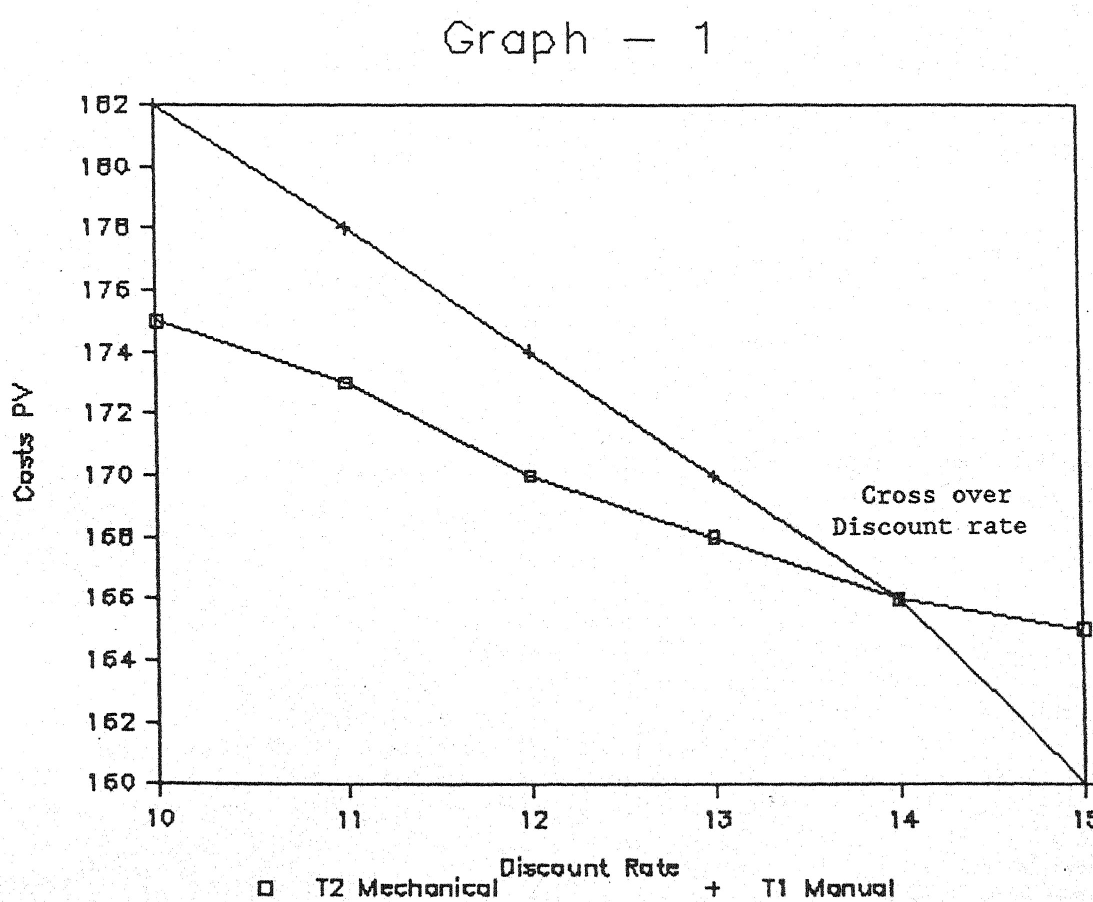
TABLE IX DIFFERENCES IN THE TWO COST-STREAMS

Year	Difference Between Cost Streams	PV 10%	PV 15%
1.	-64436	-58572	-56059
2.	+22716	+18763	+17173
3.	+22716	+17060	+14947
4.	+21623	+14769	+12368
5.	+21623	+13428	+10747
Total	+24242	+5448	-824

Cross Over Rate = 10 + 5 (5448/6272) = 14.10

It is seen that 14.10 % is the cut off rate.

GRAPH


Graph — 1
Costs PV
182
180
178
176
174
172
170
168
166
164
162
160
10
11
12
13
14
15
Discount Rate
Cross over
Discount rate
T2 Mechanical
T1 Manual

SOCIAL COST-BENEFIT ANALYSIS-AN OVERVIEW

K.L.CHAWLA

Cost-Benefit analysis is a practical way of appraising the desirability of a project involving public expenditure in terms of net social gain to the society. The principal concern of the analysis is to enumerate and evaluate all the relevant costs and benefits of a project from a social point of view, particularly when these do not coincide with the financial costs and benefits as reflected in the price-mechanism of the market place.

GENESIS AND DEVELOPMENT OF THE CONCEPT

As early as 1844, Jules Dupuit, often described as the intellectual father of cost-benefit analysis, while seeking a criterion of the value to society of public works, such as roads, canals, bridges and water works, pointed out the weakness of calling the value of a thing only what is paid for it since many users would, if necessary, pay more than they actually do pay. This, in essence, was the concept which later on came to be known as the consumer's surplus. The concept was really developed by Marshall and later on modified by Hicks, Kalder & others.

Cost-Benefit analysis began its life in the United States where early contributions to it came from the administrative agencies responsible for water resource development. The Flood Control Act of 1936 laid down the test that a project was feasible if the benefits to whom-so-ever they accrue are in excess of the estimated costs. The concept was further refined in the Green Book issued in 1950. The turning point, however, came in 1958 with the publication of Eckstein's book Water Resource Development, Mekeans'. Efficiency in Government through Systems Analysis, and Krutilla and Eckostein's Multiple Purpose River Development. These books formulated clearly the criteria in terms of costs and benefits for the appraisal of water resource projects. An important inter-disciplinary book on cost-benefit analysis entitled 'The Design of Water Resource Systems' was produced in 1962 by a group of economists, engineers and systems analysts. By this time, a well- integrated theory of cost-benefit analysis incorporating secondary or indirect costs and benefits as well as intangibles with a theoretical rationale provided by welfare economics, had been built up. Prest and Turvey succinctly described the system in their survey (Economic Journal, Dec. 1965).

In Britain, Cost-benefit analysis was first applied to London-Birmingham Motorway by the Road Research Laboratory in 1960. The next most important work was that of Foster and Beesley when, in 1963, they used this technique in evaluating the social benefits of the Victoria line. More studies followed. The most extensive and far-reaching study which used all the trappings of CBA and refined it a great deal was that regarding the selection of a site for the Third London Airport. While

interest in the area has been expanding, some manuals giving practical methods for the application of CBA have been brought out. These are UNIDO (1972) Guidelines for Project Evaluation by P.Das Gupta, A.Sen and S.Marglin and the other OECD (1968) Manual of Industrial Project Analysis. A successor volume to this is by the same authors, I.M.D. Little and J.A. Mirrlees, Project Appraisal and Planning for Developing Countries, 1975.

In contrast to this fast expanding field of CBA in the Western Countries, comparatively little has been done in India. Individual contributions are those by Sovani and Rath (Hira Kud Dam) 1960, KN Raj-Bhakra Nangal Project, 1960, A.K. Sen, Employment, Technology and Development, 1975, D. Lal, Wells and Welfare, 1972 and Appraising Foreign Investment in Developing Countries, 1975. The Project Appraisal Division of the Planning Commission have brought out Technical Working Papers, 1-15, on Social Prices and this is a very valuable contribution to the subject. Recently the interest in the subject has been growing and many studies, particularly in the fields of transport, irrigation have been conducted.

According to Little and Mirrlees, much attention was not paid towards CBA in USSR till lately. This was because of the fact that the Planners in the USSR were primarily concerned with sectoral consistencies and not with project selection at local levels. In East European countries, however, project appraisal on the basis of accounting prices or even world prices has been extensively used.

CBA AND FINANCIAL ANALYSIS

In financial analysis particular emphasis is placed on the ability of the projects to meet all operating costs and also to earn an adequate return on the funds invested. This return should cover depreciation charges and the actual cost of capital to the enterprise. Economic analysis takes a wider view. It does not limit itself to the investing agency but extends its purview to include the country or region as a whole. It consists essentially of determining the priority sectors for investment in accordance with the social opportunity cost of capital.

CBA and financial analysis, however, supplement each other. In view of the budgetary constraints, demands for developmental and non-developmental funds in the public sector and inadequate capital formation, financial analysis of all projects in public sector becomes imperative in all projects. Even so within the given budgetary constraints, if the objective of maximizing social welfare is to have precedence over that of making profits, selection of projects implying the allocation of scarce resource, has to be done on the basis of social opportunity cost of capital rather than the expected financial return.

DIRECT COSTS AND BENEFITS

The primary costs and benefits which concern exclusively and investing agency are called direct costs and benefits. These will yield annual streams of costs and revenues. In the case of projects where there are no direct revenue streams, the costs will be balanced by benefits as in the case of irrigation projects. Similarly in the case of infrastructural projects like roads, there will be only benefits and no revenues apart from their charges (taxes).

Financial estimates of operating costs, operating cash flow will reflect inputs and outputs of the projects. More especially, the major components will be as follows:

1. The investment cost: Typically, these costs, also known as the 'fixed' costs, will be of the following nature:-

    a. Preliminary costs of investigation, studies etc.

    b. Land including site preparation

    c. Plant & equipment

    d. Buildings and structures

    e. Roads, railway sidings, etc.

    f. Utilities and amenities for workers

    g. Township - Housing and community facilities

    h. Engineering and project management

        1. Royalty fees
        2. Consultancy
        3. Labour training before operation

    The Operating Costs: These include the following:

        a. Raw Material

        b. Fuel

        c. Utilities

        d. Labour

        e. Repairs and maintenance

        f. Selling expenses

        g. Administrative and miscellaneous

These costs are generally classified as "Variable". But in the case of costs which depend on the plant size, as in the case of maintenance, these costs will be treated as "fixed".

SECONDARY COSTS AND BENEFITS

A basic difference between financial and social returns, as already pointed out, consists of the external affects of the investment. An external effect may be said to occur whenever-

a. an economic activity or measure in the form of production, consumption or distributional policy affects the production or utility level of other producers or consumers;

b. the effects are un-priced in the cases of external economies (benefits) and uncompensated if the effects happen to be external dis-economies (costs).

Externalities affect the utility function (level) of the consumers and sometimes producers. These may be in the form of disamenities like noise from aircraft, motor vehicles, or pollution. These effects may be pecuniary when there may be a change in the output or utility of a third party due to changes in the level of demand. These will occur in the case of supply processing industries.

Externalities arise because there are no property rights in certain areas of economic activity. For example, a firm feels free to dispose of effluent in air or water because these are free goods. Other consumers cannot enforce their right to free air & clean water because of legal lacunae. CBA, however, operates within the existing system and rules have been devised to bring such non-marketed effects into the valuation procedure.

Departures from competition also lead to secondary benefits. Suppose a public sector irrigation project provides water for the production of sugarcane. The contribution made by this water to aggregate consumption cannot be measured by the price paid by the growers, particularly because the processing mills earn monopoly profits. The refiners may in fact be willing to contribute towards irrigation projects just because it helps to increase their profits.

Suppose, the irrigation project leads to an increase in the production of sugarcane sufficiently to make the price of sugar to consumers fall; the consumption gains to consumers are in addition to the gains of the growers and refiners. Thus a change in the relative price may be a secondary benefit.

We have already noted the existence of externalities to consumers. Suppose, a road system has to be built for the irrigation project. This may also provide good communication to the village people. This is a bye-product of the irrigation scheme and this benefit should be included in the valuation.

The irrigation project, say a dam, may in inundate some land upstream. The cost of the affected land and the value of its crops foregone will be a secondary cost.

In addition to the secondary costs and benefits which can be quantified and brought within the measuring rod of money, there may be effects, like changes in the scenic value, landscape, at least in the way other affects can be measured. In such cases, it is best to try to quantify such of the effects as can be so quantified and simply describe the other effects as best as one can.

SHADOW PRICES

The major innovation in the shadow pricing methodology has been the valuation of traded goods at 'border prices'. A large number of goods and services used in projects or produced by them are either imported or exported by the country in question, so that the effect of using more of these goods or producing more of them has a direct effect on the external trade position. For example, if wheat is freely imported for domestic consumption to make up production shortfalls, then the effect of a project to produce more wheat is to reduce the import bill and thus save foreign exchange. In such cases the true economic value of the output is its c.i.f. import price-known as the border price-whatever the domestic market price (probably arbitrarily fixed by the government) may be.

This concept also applies to exported goods to the extent that project output increases them, or uses inputs that might otherwise have been exported. Thus the true price of exportable goods is f.o.b. price.Tradeable inputs/outputs

Whether a commodity is traded or non-traded, will depend on whether it could be traded without special administrative sanction. There may be quotas, tariffs, licences etc. which will affect its status as a 'traded'good to a large extent. The domestic prices of traded commodities are influenced by export and import tariff, direct and indirect taxes, subsidies on exports, quantitative restrictions on imports, licenses, and price and distributional controls. This leads to a divergence between the domestic and international price which may vary both with the variations in the effects of above factors as well as the variation in the international prices (and exchange rate) of the goods. The quantum of this variation is referred to as the "implicit tariff" which is not the actual tariff but the effect of all the factors

which kept the domestic prices different from 'border' prices. When 'border' prices are not available, it is necessary, in such cases, to have accounting ratios which can be used directly to convert the value of the relevant good at domestic prices into border prices. Thus if the domestic price of good is P_{id} and its international price (cif/fob) is P_{iw}, then the accounting ratio A_i for good i is defined as

$$A_i = \frac{P_{iw}}{P_{id}}$$

This accounting ratio can be used for converting the domestic prices into international prices. Trading margins and transport costs, valued at social prices, have to be added to the border prices to get the social prices of traded goods.

NON-TRADEABLE INPUTS/OUTPUTS

This category includes goods which do not enter international trade such as transport, electricity, construction or those commodities which are not traded or only partially traded because of various govt. policies in the form of import restrictions and/or extremely high tariffs. In the case where these are a relatively unimportant element of the project costs, a "Standard Conversion factor" can be used, which relates average domestic prices to average international prices, but when non-traded commodities occur as significant items (such as road user costs in a road transport project), then the item is broken into its own input components (i.e. the resources required to produce it) and the shadow price of each of these components applied so that the true cost can be found. Accounting ratios for these inputs can be directly used to convert the market value of the non-traded goods or their traded components into their social value.

TAXES AND SUBSIDIES

The first and most comprehensive adjustment to the market prices is that arising from the incidence of indirect taxation. Market prices are often inclusive of sales, excise and other indirect taxes which inflate the true economic cost of the commodities taxes. On the other hand some commodities may be subsidised. Thus while taxes should be deducted, subsidies should be added to the market prices to arrive at economic prices.

Another way of expressing the same concept would be to add the tax element in the expenditure directly to the NPV of the project as an external benefit-an addition to state income. This is, however, rarely done.

The same consideration applied to the net profit component in the goods and services supplied by state enterprise, which should be deducted from the unit cost of input to the project because in economic (although not administrative) terms it is exactly equivalent to a sales tax. Equally, the loss element in any particular input price should be added to the project costs, as it is equivalent a negative tax.

SOCIAL WAGE RATES

Acute, chronic and widespread unemployment or under-employment is one of the universally prevailing features of developing economies. The exploitation of workers is avoided in such situations though the statutory fixation of minimum wages payable to workers of various categories which may be higher than what a worker would ordinarily earn. The problem of overpricing of labour has often been formulated in terms of the agricultural surplus labour' hypothesis. It states that many developing countries are characterised by surplus labour in agriculture. Such labour could be transferred to industrial sector leading to an increase in the level of output. This implies that the level or real wage in industry exceeds the social marginal cost of labour. Some Western economists, therefore, maintain that the social marginal cost of labour in developing countries is zero, i.e., from the society's point of view labour is effectively a free good. This view is, however, generally rejected. Firstly, the transfer of labour from agriculture to industry itself involves costs. Secondly, at peak sowing and particularly harvesting time there is an all round shortage of labour so that the wage rates paid at such times are substantially higher than those paid during the lean period. It is, however, to be conceded that the marginal product of labour and agriculture will be appreciably less than the market wage rate in organised industry. This can be taken at half of the market rate. Alternatively it may be more useful to use the wage rates prevailing in the unorganised sector of urban labour markets such as the rates paid to construction labour or domestic servants. These may serve us a fair index of cost of labour to the society.

FOREIGN EXCHANGE

Since the currencies of developing countries are likely to be overvalued in relation to certain commodities or services, the value assigned to foreign exchange transfers involved in a project cannot be presumed to be equal to the official exchange rate of such currencies. While corrections will have to be made to the foreign exchange rate, the range for such corrections will be provided by the official rate of exchange (lower bound) and the black market price (the upper bound). The shadow price of exchange rate is determined by the weighted average of the ratios of domestic market clearing prices to import (c.i.f) prices converted to domestic currency at the official exchange rate, the weight being the proportions of foreign exchange allocated at the margin to various inputs. Apart from the comparative purchasing power of the domestic currency vis-a-vis the foreign currency, it is the value attached to the earning of foreign exchange by the community or the

Govt. that is very relevant for determining the shadow rate of foreign exchange. Thus more keen the national level planners are regarding the earning cf foreign exchange or the saving of foreign exchange of investment in a particular sector, the more will be the weightage to be attached to foreign exchange earning from a project. Obviously, all these decisions can be taken at the national level and the shadow rate of foreign exchange can be determined by a national planning agency.

SOCIAL DISCOUNT RATE

The gains from a project are expressed in yearly streams of revenue of cash-inflows over its life-time. It would obviously not be correct to add up these Cash-inflows to get the total present value of future benefits. This would ignore the social time-preference - a preference which society exhibits for present benefits. One would think that the market rate of interest would represent this time preference so that it could be used for discounting the future cash flows. But capital markets are not markets in "competitive equilibrium". The market rates of interest reflect the preferences of individuals which include shortsightedness, so that the use of these rates would clearly imply a bias in favour of consumption as against investment. The relevant rate of interest which would clearly imply a bias in favour of consumption as against investment. The relevant rate of interest which would represent the society's preference would, therefore, be relative to the rate of socially desirable investment.

While several approaches have been advocated for determining the discount rate, essentially it is the yield from alternative projects which must be foregone in order to obtain the benefits of the project in question. The social discount rate or the social cost of capital is, therefore, the marginal productivity of capital, in the (public) sector from which the funds are withdrawn.

Some studies on the social rate of return on capital in India point to a rate of 13 to 17 percent, depending upon the accounting ratio of social wage to market wage rates. Studies conducted by the World Bank indicate that the opportunity cost of capital in less developed countries may range between 6 and 12 per cent and may often be above 10 per cent. The rate generally recommended for a sensitivity analysis is 6-12 per cent.

DISTRIBUTIONAL JUSTICE

Costs and benefits arising out of a project do not have the same impact on all sections of a community. There may well be some projects which have as their objective some redistributive effect (e.g. providing services for some target group at the expense of another target group) and these projects which might sometimes seriously disadvantage a particular group of people. In such cases it is clearly necessary

to know whether the intended beneficiaries will in fact benefit and by how much and whether the intended bearers of costs will in fact be those who actually bear the costs and by how much.

It is now generally agreed that distributional effects can be incorporated into the analysis by adopting a system of "weights" which reflect the social value placed upon additions to (or subtractions from) the real income of different groups. A practical approach that is generally followed is based on the principle of diminishing marginal utility of money. A unitary elasticity is assumed and the weights are defined as the inverse ratio between the per capita income of the group in question (Yj) to the national average (Y):

$$W_j = \frac{Y}{Y_j}$$

This simply means that an extra rupee to a man earning Rs.1000/ p.m. is worth five times as much as it is to a man earning Rs.5000/-p.m.

DECISION CRITERIA

Amongst the criteria employed for determining the social desirability of projects, the techniques of benefit cost ratio, net present value and internal rate of return are the most widely used.

B.C. RATIO AND NPV

The social worth of a project as compared to alternative projects or investment opportunities in general can be determined by using the criterion known as the benefit-cost ratio. First step in this process is to record, year by year throughout the life of the project, all outflows of cash in respect of the cost of the project construction, maintenance and operation and replacement of assets and all inflows of cash in respect of receipts (benefits). Next, all the net cash flows, positive or negative, are discounted back to a base year, which is either the first year of operation of the project or the year in which the project Report is submitted for administrative approval. The process of discounting introduces an element of compound interest into the calculations, thus giving more weight to early receipts than to late ones. This implies multiplying all receipts and payments by $(1+r^t)$ where r is the social discount rate and this the number of year over which the costs and benefits of the project are likely to spread. This process gives separately the present value of all costs and benefits, at the relevant rate of discount to the present value of the present and future investment outlays and other costs, at the same rate. Algebraically, it can be expressed as:

$$\frac{\sum_t B_t(1+r)^t}{\sum_t C_t(1+r)^{-t}}$$

Where B_t represents the net cash inflow during the period t;

C_t represents the net cash outflow during the same period; and r is the social discount rate.

Priority ranking of the projects can be done on these order of their B.C. ratios and in case there is not capital rationing, all projects with B.C. ratios greater than one are selected.

A slight variant of B.C. ratio is the criterion of Net present Value (NPV) which is simply the difference between the present value of benefits and costs rather than the ratio between the two as is done in obtaining B.C. ratio. The project with a positive net present value can be selected. If two projects are incompatible or mutually exclusive, the project with the highest NPV can be selected.

INTERNAL RATE OF RETURN

The calculation of B.C. ratio and NPV requires the use of a specified social discount rate for discounting future benefits and costs. The alternative criterion of an internal rate of return (the 'yield', solution rates, mean the same thing) requires the calculation of a discount rate that will make the present value of cash proceeds (benefits) expected from a project equal to the present value of cash outlays (costs) of the project. In other words it is that rate of discount which makes the NPV of the projects equal to zero. Algebraically, it can be represented as :

$$t \quad B_t(1+r)^{-t} = C_t(1+r)^{-t}$$

Where Dt, Ct and t have the meanings assigned to them in the previous section and r is the solution rate for which the equation has to be solved. The process of working out IRR is iterative. One starts with some likely discount rate and by a process of trial and error arrives at the correct or the nearest rate. The IRR can then be worked out by interpolation between the two trial values. There is no doubt that the calculations can at times be tedious but it is this criterion which is well understood by the decision-makers.

AGRICULTURAL PROJECT MANAGEMENT

PROF. M.SUBRAMANIAN[1]

Agricultural projects can be managed only with reference to stated objectives. The core objective of any agricultural project will have to increase the productivity per hectare consistent with (a) the maintenance of ecological balance without deterioration of land resources in the long-term and (b) a sustained increase in farm income after project implementation. Specific projects may have additional objectives depending on the emphasis placed on specific technologies or inputs in achieving greater productivity.

2. Different types of agricultural projects emerge on the basis of the emphasis referred to at the end of the last paragraph. One such basis for greater productivity is the adoption of new improved production technologies developed on the basis of sustained agricultural research. These technologies need to be adapted to farm conditions and operationalised on farmers' fields -- known as transfer from lab to land. The knowledge relating to such technology adoption has to be imparted to the farmer through the agricultural extension machinery. Thus the first line category of agricultural projects are those relating to the deployment of human resources and increasing their ability to get things moving on farmers' fields -- from agricultural scientists and extension workers to farmers themselves. These are development projects with emphasis on training and extension using new technological breakthrough.

3. Another set of agricultural projects relate to supply management of inputs. With any given technology optimum production is possible only if the farmer is assured of the required inputs in adequate quantity at the right time at a proper price. Several agricultural projects relating to credit supply, seed production, fertilizer marketing, pesticides supply and irrigation water management will fall under this category.

4. The last set of agricultural projects relate to the processing and marketing of agricultural produce or agro related products and the improvement of the physical or marketing infrastructure which will all go to increase the value added by agricultural production and the farmers share of incremental incomes.

5. Thus project identification becomes the first step of project management. The objective of the project must be clearly perceived in planning the project as described in the preceding paragraphs. The second step is to outline the strategy for achieving the stated objectives. The strategy may involve technology adoption, better use of

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1. Former Agriculture Secretary, Ministry of Agriculture, Government of India. At present Director, Dry Farming Research Centre, New Delhi.

inputs, efficient produce marketing or a combination of these and other activities aimed at increasing productivity and income per hectare. At the final stage of project planning, it is necessary to outline the present input output relationship in agricultural production, which is sought to be improved with the proposed project. The incremental inputs to be provided and the cost thereof need to be identified along with the anticipated incremental output resulting there from and its value.

6. The next step is project evaluation, in which the present value of the streams of costs and benefits will have to be analysed to see if the investment is worthwhile for the economy as well as the farmer. The cash flows will also need to be analysed to see what implications arise for budgetary support or credit support for implementing the project.

7. If on evaluation the project is found acceptable and implementation is started the following steps must be taken:-

(a) an action plan must be drawn up detailing the various steps on a time frame indicating the action and the person accountable for it.

(b) the technology to be propagated must be proven i.e. it must have been successfully tested out on farmer's fields during pre project trials and demonstrations.

(c) the extension services must be adequately strengthened quantitatively and qualitatively (by appropriate and adequate training) to be able to help farmers in the project area to successfully use available technologies. This is the man-power aspect of project management.

(d) The organisational structure for implementing the project must be worked out. Either existing organisations can be strengthened or new organisations can be set up. Specific attention must be given to the description of the authority vested in different persons and their accountability for results, in the form of a performance budget.

(e) The project must be subjected to ABC analysis in respect of the resources to be made available for the project, so that the key inputs can be planned for in advance and budgeted for, procured and supplied.

(f) The Key Result Areas which represent the principal objectives for achievement through the project must be identified and integrated in a meaningful project monitoring system.

8. In the implementation of agricultural projects generally the following have been found to be key result areas that must be the focal points of attention for project managers viz.

(a) identification of appropriate technology and its demonstration on farmers fields in pre project phase.

(b) advance recruitment and training of extension staff in technology transfer.

(c) monitoring of the supply of physical inputs like improved seeds, fertilizers, pesticides, implements etc.

(d) the planning of the crop rotation based on optimum land use and sensible water management to minimize the impact of unforeseen monsoon conditions on crop production.

(e) soil and water conservation measures to be adopted (particularly in small watersheds by farmers on a community approach) for sustaining crop production on a long term basis.

(f) adequacy of the infrastructure for credit support and transport and marketing/ processing of the additional production under the project.

PROJECT ORGANISATION FOR AGRICULTURE

PROF. M.SUBRAMANIAN[1]

The most difficult area of agricultural project management is the project organisation. This difficulty arises from the fact that the organisation is expected to reach out to millions of farmers under the project and ensure the incremental productivity of individual farms. The success of project management becomes coterminus with the ability of the project organisation to work in unison with farmers.

1. Thus project organisations must first be structured for the purpose of effectively working with the farmers at the grass root level. The assignment of specific responsibility for helping identified farmers to draw up and implement farm level plans, becomes the basic principle for deciding on the component of village level workers under an agricultural project.

2. In assigning village level workers to work with farmers, it must be ensured that their training is comprehensive enough to enable them to solve all farmers' problems relating to the production plan and not merely those problems relatable to the specific project under implementation. Thus every agricultural project, however, specific or limited in scope, has to blend with the overall farming activity at village level if it expects to achieve any measure of success. The first test of propriety for an agricultural project organisation is the extent to which it achieves the above objectives.

3. The second objective of an effective project organisation must be to provide a proper line of control/coordination so that (a) organisational structures are simple and direct so that they are easily accessible to farmers (b) the responsibility and accountability is clearly placed in the hands of these otherwise accountable for agricultural development of the area to avoid diffusion of authority and confusion in organisational linkages. (c) specialist support is provided more as staff support to general project functionaries, rather than providing a separate line of control for specialised services, particularly of a technological nature.

4. The third objective of a good project organisation is to provide for effective supervision and control. The only way this can be done for agricultural projects is to ensure (a) that supervisory staff go out in the field long enough in the agricultural season to see for themselves how the farm plans are coming up and to interact with farmers and extension workers, giving them guidance on the spot (b) the tasks to be performed over a timeframe by field and supervisory staff are spelt

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1. Former Agriculture Secretary, Ministry of Agriculture, Government of India. At present Director, Dry Farming Research Centre, New Delhi.

out in advance and the performance monitored realistically by the top management.

5. The fourth objective, which is specific for agricultural projects is proper project coordination with the provision of inputs and services (through the supporting infrastructure) to farmers, even though the same may not form part of the project. This is because any incremental production envisaged under the project will be adversely affected by the non-provision of such necessary inputs and services in adequate measure. Thus the linkages of the project organisation (vertical or horizontal) with external aspects of infrastructure support are as important as the components of the project organisation and the effectiveness of these linkages is part of the key result areas to be monitored in the project management system. The importance of such linkages can be indicated with reference to examples such as:

(a) Supply of fertilizers and pesticides in improved seed multiplication projects.

(b) Credit supply in irrigation projects.

(c) Animal health services in dairy projects.

(d) Marketing services for rural handicraft production projects etc.

6. The fifth objective for such projects is availability of adequate and timely feedback from the field. This feedback is the core of the information system for the project. Even at the stage of project planning, adequate thought should be given to:

(a) the data that is absolutely necessary to ascertain the incremental production per hectare, albeit on a statistical inference basis (because of large number of farms involved).

(b) other relevant information for determining the inputs, used for the project and monitoring their effective deployment.

(c) the format and periodicity of reports to be rendered by different levels of project organisation and (d) the processing of these reports to provide an effective tool to project management (mostly in the form of exception reports drawing attention to deviation from planned results) to take timely corrective action where needed.

In agricultural projects the information systems must adequately take care of (a) periodic reports from village/farm level to be used for aggregate analysis for the project as a whole (such reports forming a vertically integrated system) and (b) independent evaluation on the basis of measurement of parameters under the supervision of an expert

wing in the project organisation (such evaluation being concurrent in the process of project implementation). The former takes care of information flows in the system while the latter provides for adequate management audit of results under the projects. The two are both complementary to each other.

7. Finally a responsive project management at the top is necessary, which alone can face the realities that a monitoring system throws up. Project management must have courage to change the course of a project and revamp it if the feedback necessitates such midcourse correction. The management information system is good in agricultural projects only to the extent, it reflects farm situations and farmers responses, truthfully and ruthlessly, instead of trying to cover up. This is possible only in a project environment where top management is perceived to be willing to face the hard truth and respond to it. The proverbial stitch in time saves nine is more true of agricultural projects than others. The volatile and unpredictable course of many agricultural projects is inherent.

The productivity of small farms particularly under rainfed conditions is subject to so many unpredictable factors of weather, environment and management that any good agricultural project manager must be prepared to face the consequences of short falls in comparison to theoretically predicted results based on supervised trials in the agricultural universities. The skill of project management lies in scaling down anticipated results to realistic farm levels so that project organisations can be made accountable for getting realistic targets achieved.

OVERVIEW OF PROJECT MANAGEMENT

S. SAROJA

1.0 INTRODUCTION

Project management is relatively modern in that it is characterized by new approaches and adaptation of special management techniques. Twenty years ago project management was confined to the Department of defence, industry, contractors and construction companies. Today, the concept behind project management has spread to virtually all sectors of economy including agriculture, fisheries, irrigation, poultry, hospitals, State and Central Government agencies.

The rapid rate of change in both technology and the market place has created enormous strains upon existing organizational forms. It is felt that temporary management systems as project management, which are highly organic and can respond rapidly to an ever-changing situation should replace the older systems.

The unique nature of these temporary management systems as task forces for project management tends to separate them from the parent organizational structure and sometimes alienate the parent organization which is responsible for organizational equilibrium.

Project management has been theorized by academics as one of several approaches to organizational forms of the future, designed to integrate complex efforts. This adaptation to the new form requires that the vertical organisations should change to a more decentralised set up.

The point of change can not be visualized but there are certain symptoms which bring out the need for the change. Generally the symptoms are:

(i) Administrators did not have adequate financial information and control of their operations. Administrators for example, did not know how much it cost to produce the output. Prices and margins were set adhocly.

(ii) Cumbersome communications channels existed between key functions especially production and marketing.

(iii) In the face of stiffening competition the organisation remained too internalized in its thinking and structure. It was insufficiently oriented to the outside world.

(iv) Lack of communications between different divisions not only created the antithesis of the team effort but also was wasteful of a precious resource (People).

(v) Long-range planning was sporadic and superficial; this was leading to over-staffing, duplicated effort and inefficiency.

We require a new breed of administrators who will be flexible enough to accept change and readily willing to adapt to an ever-changing environment. This adaptation requires departure from the traditional organization form which was basically vertical and which achieved successful unification of efforts through a strong superior-subordinate relationship.

1.1. PROJECT MANAGEMENT GROWTH

The growth of project management has come about more through necessity than through desire. By definition, project management can best be described as the planning, scheduling, directing and controlling of resources for a relatively short-term project which has been established for the completion of specific goals and objectives. Furthermore, project management utilizes the "Systems Approach" to management through the use of functionally controlled personnel (vertical hierarchy) assigned to a specific project (horizontal hierarchy). Project management restructuring permits organisation to:

(a) Accomplish tasks which were not effectively handled by the traditional structure.

(b) Accomplish one-time activities with minimum disruption of routine work.

The major reason for the slow growth of project management can be attributed to the lack of acceptance of the new management techniques which were so necessary for success. This inherent "fear of the unknown" or resistance to change acted as a deterrent force. The major problems identified by those who attempted the new system are conflicts in authority and resources. Three major problems were identified: by Killian[1]

* Project priorities and competition for talent may interrupt the stability of the organization and interfere with its long-range interests by upsetting the normal business of the functional organizations.

* Long-range planning may suffer as the organisation gets more involved in meeting schedules and fulfilling the requirements of temporary projects.

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1. William P. Killian, "Project Management-Future Organizational Concepts," Marquetter Business Review, No.2, 1971, p. 90-107.

* Shifting people from project to project may disrupt the training of new employees and specialists. This may hinder their growth and development within their fields of specialization.

Another major concern was the fact that project management required that senior managers relinquish some of their authority through delegation to the middle managers. In several situations the power positions were more controlled by middle-management than by senior management.

Despite these limitations, there were several driving forces behind the project management approach. According to John Kenneth Galbraith, these forces stem from "The Imperatives of Technology." The Six imperatives are:[2]

* The time span between project initiation and completion appears to be increasing.
* The capital committed to the project prior to the use of the end-item appears to be increasing.
* As technology increases, the commitment of time and money appears to become inflexible.
* Technology requires more and more specialized manpower.
* The inevitable counter-part of specialization is organization.
* The above five "imperatives" identify the necessity for more effective planning, scheduling and control.

The driving forces overtook the restraining forces, and the importance of establishing project management objectives soon became clear. The main objective of project management is to make the most efficient and effective use of the resources of;

* Manpower
* Equipment
* Facilities
* Materials
* Money
* Information/Technology

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2. John Kenneth Galbraith, The New Industrial State. (New York, The New American Library, 1968) p. 25-28.

So that the objectives and goals can be achieved

* Within budget
* On schedule
* At the desired performance/technology level

While adhering to the everchanging environmental input factors:

* Legal
* Social
* Political
* Economical
* Technological.

Project management must be regarded as a challenge. Project management attempts to achieve success in spite of such internal and external (environmental) obstacles as:

* Unstable economy
* Shortages
* Soaring costs
* Complexity
* Increased and Heightened competition
* Technological changes
* Societal changes
* Consumerism
* Ecology
* Quality of work

If these obstacles are not controlled, the results can be:

* Decreased outputs
* Increased costs
* Unemployment
* Time overruns, schedule slippages.
* Technology doubling every five years or less.

* R & D results too late to benefit existing product lines.

* New products introduced too late into the market.

* Temptation to make over-hasty decisions that are costly.

* Management insisting on earlier and greater return on investment.

* Greater difficulty in establishing on-target objectives in real time.

* A tougher and tougher job to relate cost to technical performance and schedule during the execution of the project.

"The need for flexibility has become apparent since no two projects are ever alike from a project management point of view. There are always differences in technology; in the geographical locations; in the client approach; in the contract terms and conditions; in the schedule; in the financial approach to the project; and in a broad range of international factors, all of which require a different and flexible approach to managing each project".[3]

It was seen that the task force concept, with maximum authority and accountability resting with the project manager, is the most effective means of realizing project objectives. While basic project management principles can be developed, there is no single standard project organization or project procedure yet devised that can be rigidly applied to more than one project.

Today, the project managers are being challenged as never before to achieve what earlier would have been classified as "unachievable" project objectives. Major projects often involve the resources of a large number of organisations located at different places. The efforts of each must be directed and coordinated toward a common set of project objectives of quality performance, cost and time of completion as well as many other considerations.

1.2 THE NEW ENVIRONMENT

As project management grew, it soon became evident that there must exist some guiding factors which form the basis for the underlying principles behind the project management approach. The first factor was

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3. J. Robert Fluor, "Development of Project Managers" keynote address to the Project Management Institute, Ninth International Seminar Symposium, Chicago, Illinois, October 24, 1977.

the establishment of the project manager as the focal point for the integrative responsibility, This need for integrative responsibility was first identified in development activities.

Development technology has broken down the boundaries that used to exist between different sectors of the economy. The total environment is turbulent and increasingly hard to predict. Many complex facts about markets, production technology, costs and potentials are related to investment decisions.

All of these factors have combined to produce a king-size managerial headache. There are just too many crucial decisions to be made - and to have them all processed and resolved through regular line hierarchy at the top of the organization. They must be integrated in some other way.

Providing the Project manager with integrative responsibility resulted in:

* Single person total accountability
* Project rather than functional dedication
* A requirement for coordination across functional interfaces
* Proper utilization of integrated planning and control.

The project manager's job was not an easy one. He found himself with increased authority and responsibility, but with very little power. This lack of power forced him to "negotiate' with senior management as well as functional management for control of resources. He was often treated as an outsider by the formal organization. Yet, even with these problems and roadblocks, he has managed to survive.

Project management continues to become more challenging and we think this trend will continue. This means we have to pay special attention to the development of project managers who are capable of coping with jobs that range from small to mega projects and with life spans of several months to ten years. A project manager must not only be able to manage the technology, procurement and construction aspects of a project, but also the aspects relating to finance, cost engineering, schedule, environmental considerations, regulatory agency requirements, inflation and cost escalations, labour problems, public and farmer relations, employee relations and changing laws. That's primarily on the domestic side. On international projects, the list of additional functions and considerations adds totally different complications if the project has international dimensions.

The second key factor was the establishment of an integrated planning and control system which would effectively "marry" the horizontal and vertical units of the organisation toward better project implementation and control. The requirements for the integrated planning and control system include:

* Complete task definition
* Resource requirements definition
* Timetable establishment
* Definition of end item quality and reliability requirements.
* Establishment of basis for performance measurement.

These two factors, if properly established, result in:

* Assurance that functional units will understand their total responsibility toward fulfilling project needs.
* Assurance that problems resulting from scheduling and allocation of critical resources are known beforehand.
* Early identification of problems so that effective corrective action can be taken to prevent or resolve the problems.

Unfortunately, these two factors are somewhat constrained by the fact that:

* Each project is normally of a finite time duration and exists as a separate entity within the organisation except for administrative requirements.
* The resources must be scheduled and fitted to satisfy the needs of the project, not vice versa.

The constraints can therefore cause situations which require

* Continuous revision and/or establishment of project policies, procedures and directives,
* A continuous shifting in organizational responsibilities and possible restructuring.
* An everchanging need for knowledge and skills.

In the project environment everything seems to revolve around the project manager. Although the project organization is a specialized, task-oriented entity, it cannot exist apart from the traditional structure of the organisation. The project manager, therefore, must

walk the fence between the two organizations. His title is often called interface management and his role can be described as.[4]

* Managing human interrelationships in the project organization.

* Maintaining the balance between technical and managerial projects functions.

* Coping with risk associated with project management.

* Surviving organizational restraints

Organizational restraints have the tendency of develcping into organization conflict, often requiring that the top management take an active role in conflict resolution.

Conflict resolution, strategic planning and policy formulation become the major responsibilities of senior management. The day-to-day operations of the organization rest upon the shoulders of the project and functional managers.

1.3. DIFFERING VIEWS OF PROJECT MANAGEMENT

The individuality of the organizational membership creates an internal problem for the daily operations of a project management structure because of the different ways that project management is viewed. Almost all organizational personnel have different views of project management. Each view is based upon either a traditional, social, behaviour or scientific need. Sample views might include:

* A threat

* A research area

* A new challenge

* A means to an end

Functional and Senior managers regard project management as a threat because they have had to relinquish some of their well-developed authority vested in them under the traditional organizational structure. Educational institutions, consultants and scientists view this new form of management as research area. Programme managers and project scientists consider project management as a challenge, whereas

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4. David L. Wilemon and John P. Cicero, "The Project Manager-Anomalies and Ambiguities", Academy of Management Journal, September 1970, p. 271.

functional managers tend to view this new structure merely as a means to an end.

1.4. LEARNING PROJECT MANAGEMENT

The inevitable question concerning the teaching of project management is, "Can project management be learned from a text book or an academic course, or must it come from on-the-job training?" No academic institution or textbook can teach project management in its entirety Even in the academic community there exists differing views of project management: Some stress organizational responsibility and conflict management; engineering colleges (especially the civil engineering departments) stress scheduling and quantitative tools; and some engineering and business colleges provide interdisciplinary efforts in teaching cost control. Academics must train people to become "generalist" project managers, with the "specialist" training being provided in-house.

Generalists must be exposed to the complete gamut of problems and relationships that can exist in a project environment, and are common to all project management, regardless of the type. He should be provided with the necessary tools and techniques by which he can find proven, workable solutions to problems that can occur in a project environment. There are four main objectives of this are:

* To understand how work can best be planned, scheduled and controlled in a project environment.

* To understand how to structure work so that no communications break-down will occur either inhouse or between the farmer and the project authorities

* To understand how projects are organized and how organizations function.

* To understand the working relationships that must exist between the inhouse project member as well as between the farmer and authorities, regardless of whoever they be and how corresponding program offices should interface.

It is necessary to understand the following issues to become a ompetent project manager:

* How to organize a project from beginning to end

* How to structure a plan that stands up under pressure

* How to get people to accept and participate in your plans

* How to set measurable project objectives

* How to motivate team members when the job gets tough

* How to help team members solve their own problems

* How best to utilize available resources

* How to cut out waste of time and money

* How to measure project performance

* How to use information systems that can respond to project needs

ANALYSING THE PROJECT ENVIRONMENT[5]

The project manager's job is not confined to controlling events within the project organization. It is equally important to analyse the project's linkages with its external environment. This is particularly so in a developing economy and society, where the environment is changing rapidly. A development project's "emphasis on innovation and organizational change requires project managers to interact frequently with those individuals and institutions that constitute the most important elements of the project's environment." (Radosevich)

We have been mostly discussing project management issues with special reference to planning, scheduling and control of time, cost, performance and resources. Other important topics generally included for the discussion are organizational design and the role of the project manager as a leader. In all this, the focus has principally been inward, looking inside the project management in today's dynamic world.

The development of a systems perspective is essential and the organisation must be viewed as a sub-system that operates within a large system (or environment) and interacts with other sub-systems. This analysis is useful in project management where the project is viewed as surrounded by an environment both within and outside its parent organisation.

The basic elements in the systems approach are the system itself, its boundary with the environment, and the inputs and outputs that link it to its environment (Schoderbek 1975). (See chart 1). What is this

5. Adapted from the EDI training material - CN848, July 1980. Prepared by Nicholas R. Burnett & Ronbert Tober.

CHART I

THE ENVIRONMENT

```
                              --------------
                              ! CUSTOMERS  !
        !-------------------------------------------------------------!
        !                     !*************!                         !
        !                     --------------                          !
--------!---                        !                                 !
CLIMATE !**!-------------!          !                                 !
--------!---             !          !                                 !
        !                !          !                                 !
--------!-----           !          !                              ---!--------------
LABOUR  !****!--------!  !   THE ORGANISATION       !-----------!**!ECOLOGY
--------!-----   ........................................          ---!--------------
        !                                               .             !
--------!----    .---------   ---------   ---------     .        ----!--------------
SUPPLIES!***!-----.!INPUTS!   !PROCESS!   !OUTPUTS!     .-----!***! GOVERNMENT
--------!----    .---------   ---------   ---------     .        ----!--------------
        !        .  !                       !           .            !
--------!----    .  !                       !           .        ----!--------------
CAPITAL !***!-----. !    FEEDBACK/CONTROL   !           .-----!***! PUBLIC
--------!----    .  -------------------------------     .        ----!--------------
        !        ........................................            !
--------!-----      ! !          !                 !           -----!--------------
CREDIT  !****!--------! !          !                 !---------!****! COMPETITORS
--------!-----          !          !                               -----!--------------
        !               !          !                                  !
--------!------         !          !                                  !
LAND    !*****!-----------!        !                                  !
--------!------                ------------                           !
        !                      !***********!                          !
        !--------------------------------------------------------------!
                               !TECHNOLOGY!
                               ------------
```

```
!----!
!****!  --------  Degree of Control
!----!

!----!
!    !  --------  Degree of Independence
!----!

!.....
!.   .  --------  Demarcates the System from Environment
!.....
```

Adapted from Schoderbek P.P. et. at <u>Management Systems</u> Business Publications Inc. 1975

project environment? The environment includes virtually everything outside the project: "its technology, the nature of its products, customers and competitors, its geographical setting, the economic, political and even meteorological climate in which it must operate, and so on." (Mintzberg 1979). These factors - and especially changes in them - can affect the planning, organizing, staffing, directing and so on which constitute the project manager's chief functions.

The key conclusion to be drawn from the systems perspective and the concept of the project environment is that the project has relationships with other sub-systems or other organisations in the environment. These create dependency relationships on both sides. To be ultimately successful, therefore, the project manager must look outside the project. He must study and try to manage or adapt to the relevant external forces on which the project's success depends.

Galbraith (1973, 1977) introduces the concept of uncertainty as the key factor in analysing the project environment. Uncertainty becomes a problem for the project manager because of the dependency relationship between the project and the elements in its environment which are not controlled. The greater the degree of dependence and the greater the degree of uncertainty the greater the problem for the project manager. So the basic purpose in analysing the project environment is to define potential problems, to assess the probability of their occurrence, and to try to solve them.

To do this, the project manager needs to define:

* The other organizations or sub-systems in the project environment;

* the nature of the dependency in its relationship; and

* the nature of the uncertainty.

The relevant environment will clearly be different for each project. The scientific relevant environment for a project is determined by three factors peculiar to the project (Galbraith 1977):

* the product (service)/market (user) context of the product;

* the technology involved; and

* the physical location.

For example, development of the USAR Land in Lucknow[6] will most likely increase the demand for mineral gypsum and other soil amendments. The suppliers of these soil amendments and other inputs will become key elements in the project environment. Similarly, the demand for farm labour will go up, and it will also become a key element in the project.

The manager should focus on finding the relevant elements and classify them:

* <u>suppliers of inputs, consumers of outputs, competitors, and regulators;</u>

* <u>physical</u> (e.g. climate), <u>infrastructural</u> (e.g. power supply), <u>technological</u> (e.g. plant genetics), <u>commercial/financial/economic</u> (e.g. banks), <u>psychological/sociocultural</u> (e.g. attitudes towards credit, risk), or <u>political legal</u>,

* <u>hierarchical</u> and sometimes geographical, such as government at various levels <u>national, regional</u>, <u>local</u>, <u>Central and State</u>;

* <u>actors</u> (e.g. individuals, groups, institutions) or factors (e.g. attitudes, trends, laws);

* <u>controllable</u> (the manager/project can affect these without them affecting the project), <u>influenceable</u> (the manager/project can affect these but they can also affect the project) or <u>appreciated</u> (the manager/project must react to these but cannot affect them (Smith et al 1980). Chart II demonstrates these classifications in schematic form.

ENVIRONMENTAL SCANNING

Clearly not all the elements in the project's environment will be crucial to the project's success. Identifying those which are relevant and important by systematically scanning of the project environment should be an important part of the project manager's job. This environmental scanning (environmental analysis) leads the manager to identify the important elements in his environment. After listing the relevant actors and factors the project manager can proceed to assign each to one of three categories, controllable, influenceable or appreciated. He will be in a much better position to manage once he knows which elements he can control or influence and which he can only appreciate, which environmental factors and trends are the most important for his project and which actors can most affect the success of the project.

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6. Refer Chapter 24 in this book.

The identification of the key actors in the project environment is sometimes known as "Stakeholder mapping" i.e. mapping out which people or groups have a stake in the project's success or failure.

The process of scanning the environment to identify and monitor those elements that can affect the project is extremely important for the manager. Schemes such as those in Chart II can help him to be systematic about it, but the relevant elements must be identified separately for each project and rated for degree of importance to project success.

Once the manager has scanned the environment and identified the key elements, his work is not over. He must:

* continue to scan for new elements that may effect the project outcome;

* monitor those elements he has identified as key ones to detect changes in them that will affect the project; and

* develop the skills necessary to evaluate the project's linkages with the key elements of the environment and to manage these linkages.

Trist (1965) has coined the term "environmental turbulence" to relate the increasing pace of change in the world to the task of managing the organizations. The social, political, economic, financial and technological upheavals in the environment are almost certain to change the life of a project. Examples which come immediately to mind are Iran, interest rates, micro-computers and oil prices, all of which have surely influenced many projects.

In environmental analysis, the project manager must also look at trends over time and must try to spot and analyse dynamic factors which are not yet or only beginning to affect the project. This job is not as hard as it seems. The basic forces often are readily identifiable for those who want to see them. For eg. the cost curve of micro-circuits had a steady decreasing trend for several years.

When the actors change and the relationship also changes. They change in part either because of change in management or organization. To manage the environment, the project manager needs to know:

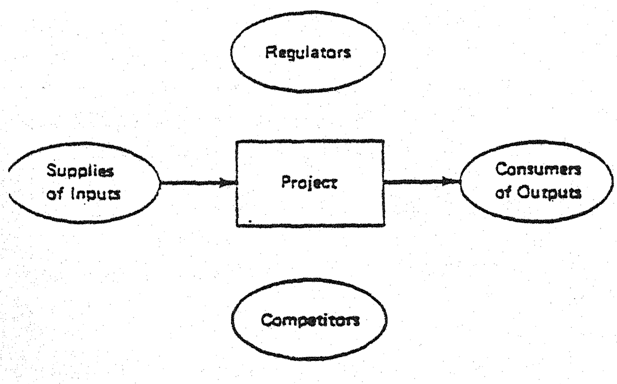
* the important actors and factors in the relevant project environment;

* the degree of control or influence the project has with those actors and factors;

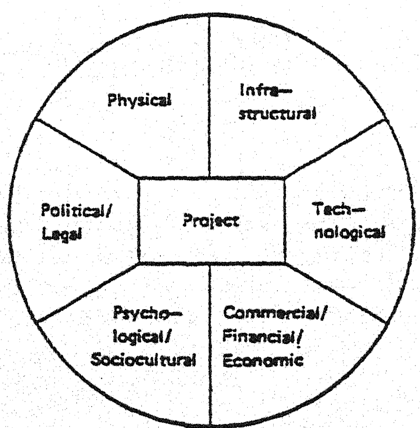
* the existing linkages with those actors and factors.

Chart II

CHART 11 THE PROJECT ENVIRONMENT



(1)



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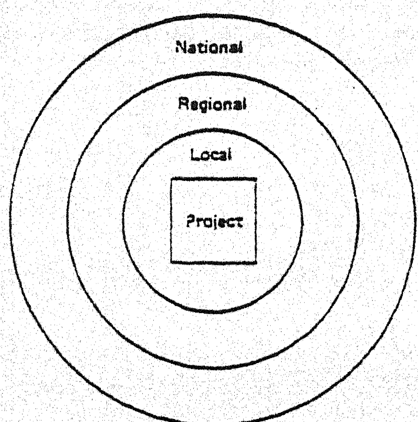

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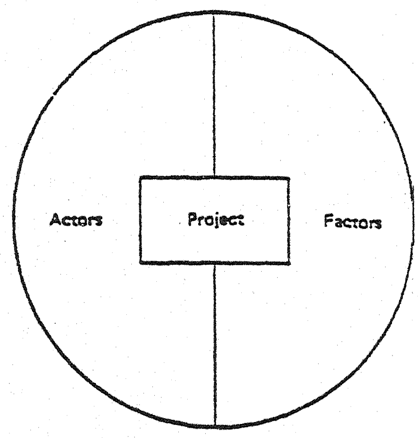

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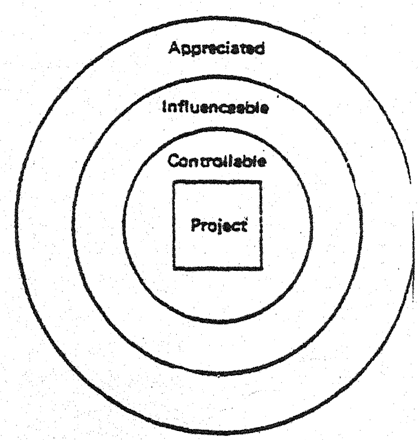


(5)

The means of managing key environmental factors involves both structural (organizational) and process strategies. The basic strategies involve:

* collecting information on what is happening;
* identifying problems that cannot be changed;
* developing influence and power (skills) in an attempt to "manage" key factors in the environment.
* Structural linkages include:
    - formal organizations;
    - coordinating committees;
    - liaison managers.
* Process changes include:
    - plans;
    - reports;
    - team building.

It is probably easiest to demonstrate the importance of environmental scanning with a specific example. Consider an agricultural project recently financed by the National Bank in India:

1. support on-farm development of about 1000 farmers and small livestock farms through the provision of credit;
2. consolidate the development schemes in one region of the country by providing credit to 3,000 small mixed-farms (mainly cotton and soyabeans) and constructing rural roads.

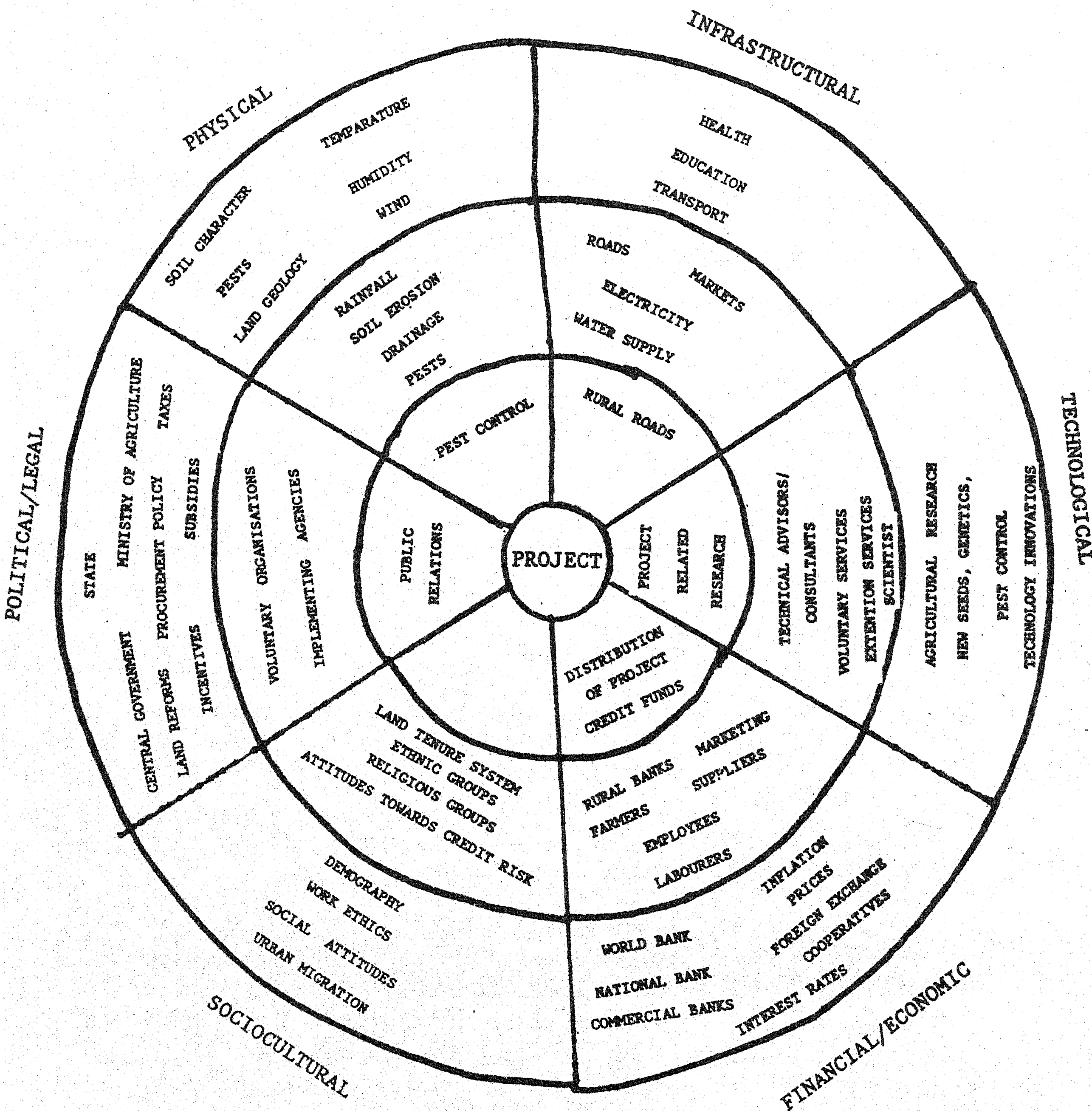
Chart III demonstrates many of the elements in the above said project environment. Undoubtedly there are others. On the Chart it can also be seen that key actors are indicated thus:

FARMERS and <u>key factors</u> thus: CREDIT

CHART III

ENVIRONMENT SCAN

chart III



Adapted from EDI Training Material - CN848 - July 80

PROJECT MANAGEMENT - A CONCEPT

S. SAROJA

1. INTRODUCTION

Unlike the relatively steady state of an on-going enterprise a project has some distinctive characteristics of its own. Capital undertakings normally have a well defined starting point and objective which identifies the completion of the work. Further, resources limited in one way or another place constraints on the work to be accomplished, and underline the need for special management control. Hence the need for project Management.

1.1 - Definitions of project Management

Project

- Any undertaking having a well defined starting point, well defined objectives which identify the completion of the work, and limited resources through which the work must be accomplished. (Ken Selby,E.I.C.,1979.)

Manage

- To manage is to forecast and plan, to organize, to command, to coordinate and to control. To forecast and plan means examining the future and drawing up the plan of action. To organize means to build up the dual structure, material and human, of the undertaking.To command means maintaining activity amongst the personnel. To coordinate means bonding together,unifying and harmonizing all activity and effort. To control means seeing that everything occurs in conformity with established rule and expressed command. (Henri Fayol, Administration Industrielle et Generale, 1916.)

- To coordinate all resources to work towards the objectives of the organization.

Hence, Project Management

- The art of directing and coordinating human and material resources to achieve stated objectives within limits of time, budget and everyone's satisfaction.

- The application of modern management techniques and systems to the execution of a project from start to finish,in order to achieve

predetermined objectives of scope, quality, time and cost, to the equal satisfaction of the participants.

1.2 - Traditional Philosophy

Traditionally, administration has not been concerned with projects but with on-going programs where change is minimal and slow, with sufficient time to adjust. Changes can be thoroughly programmed and slowly integrated, with time not being 'of essence'. Such on-going enterprises typically have the following characteristics:

- relatively simple and certain technology

- traditional production quantities per season/hectare

- continuous system of work with substantial similarity in performed tasks

- tasks are clear and the people are functioning in a highly stable environment without increase in productivity or change in technology.

- roles and responsibilities of all members are well understood; relationships developed and adjusted over long periods of time.

In such an environment, the administration's role has been to maintain the flow of authority and responsibility by ensuring that :

- established on-going project organizations function on a vertical basis

- a chain of authority exists within the organization from the highest to the lowest rank, through every link in the chain. Hence, an employee receives orders from one's superior only

- strong superior-subordinate relationships exist to preserve unity of command and to ensure unity of purpose

- work progresses within autonomous functional units of the organization

- functional managers have clearly identified, finite responsibilities

- functional managers establish "staff" relationships where collective action is required.

This traditional management approach breaks down when a significant project is introduced to the organization. New management relationships

are required which cut across the normal flow of authority, and responsibility consequently radiates outside the functional unit. The project has to reach the farmers.

1.3 - Types of projects

Two broad categories of project immediately become evident according to their end result. HARDWARE projects, are those in which the final result is a tangible product, such as a godown building, pumphouse etc.

SOFTWARE project are those in which the final result is not in itself a tangible asset, such as an agricultural research, extension training, a new administrative system or even supply of quality seeds. The product or end result is a distinguishing characteristic of a project. That is to say, a project is not on-going activity, but rather an undertaking that end with a specific accomplishment. Project management should therefore be applied when there is a single, identifiable, overall task which is

- complex, (with reciprocal organizational and technological inter-dependencies)
- interdisciplinary (requiring coordination of two or more functional departments)
- finite (in termination date as well as performance and cost objectives.)

2. - **PROJECT CHARACTERISTICS**

2.1 - Function-Process-Time Relationship

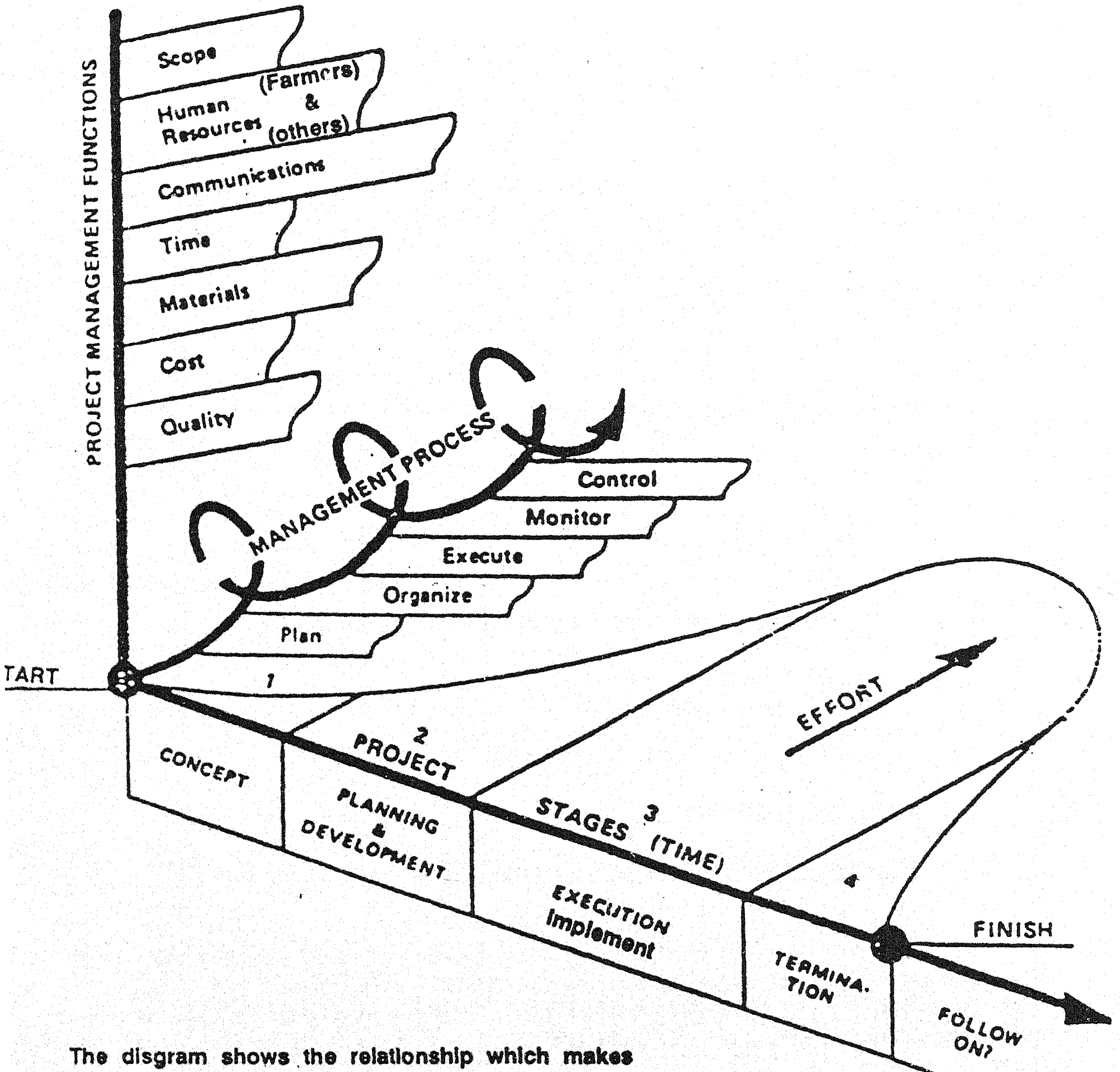
The time, process, and function components of project management form relationship which may be viewed as three dimensional. The figure 1 shows functions which are to be managed, the processes which are used by management, and their variation as the project progresses from start to finish.

2.2 - Project Stages

There are four distinct project phases or stages which make up the project life cycle

- Concept (Conceive)
- Planning (Develop)
- Execution (Execute)
- Termination (Finish)

Figure 1



The disgram shows the relationship which makes Project Management both universally applicable and unique to all project work.

Figure 1

THE FUNCTION-PROCESS-TIME RELATIONSHIP IN PROJECT MANAGEMENT

The phases may be more easily remembered by the letters CDEF.

The variation in the level of effort required to manage a project during its life time (See Figure 2.) is of special significance.

2.3 - Project Management Functions

The management functions involved in any project typically include human and other resources, communication, scope,cost, materials, time and quality. Each represents a special discipline calling for varying degrees of training, and the requirement for each function depends on the size and nature of the project in question.

Figures 3 to 6 show a breakdown of the various divisions and activities which may be anticipated within each project management function.

3. - PROJECT MANAGEMENT

3.1 - Some Basic Concepts of Project Management

Management by objectives

A project can only be executed effectively with a clear definition of the objective to be achieved, and a Plan for achieving those objectives.

Management by Exception of Plan

Once the planning is complete and the objectives have been defined, management of a project should be by exception to the plan. Any other scheme would be,and usually is, chaotic. Good management does not act - during the execution of a project unless there is a deviation from the plan. If the deviations are beyond the project's control, then the management must alter the original objectives.

Delegation of Authority

Management by exception clearly implies that authority to act during the execution of a Project must be delegated as much as possible, commensurate with the ability and experience of the project Team to make decisions in accordance with the plan.

figure 2

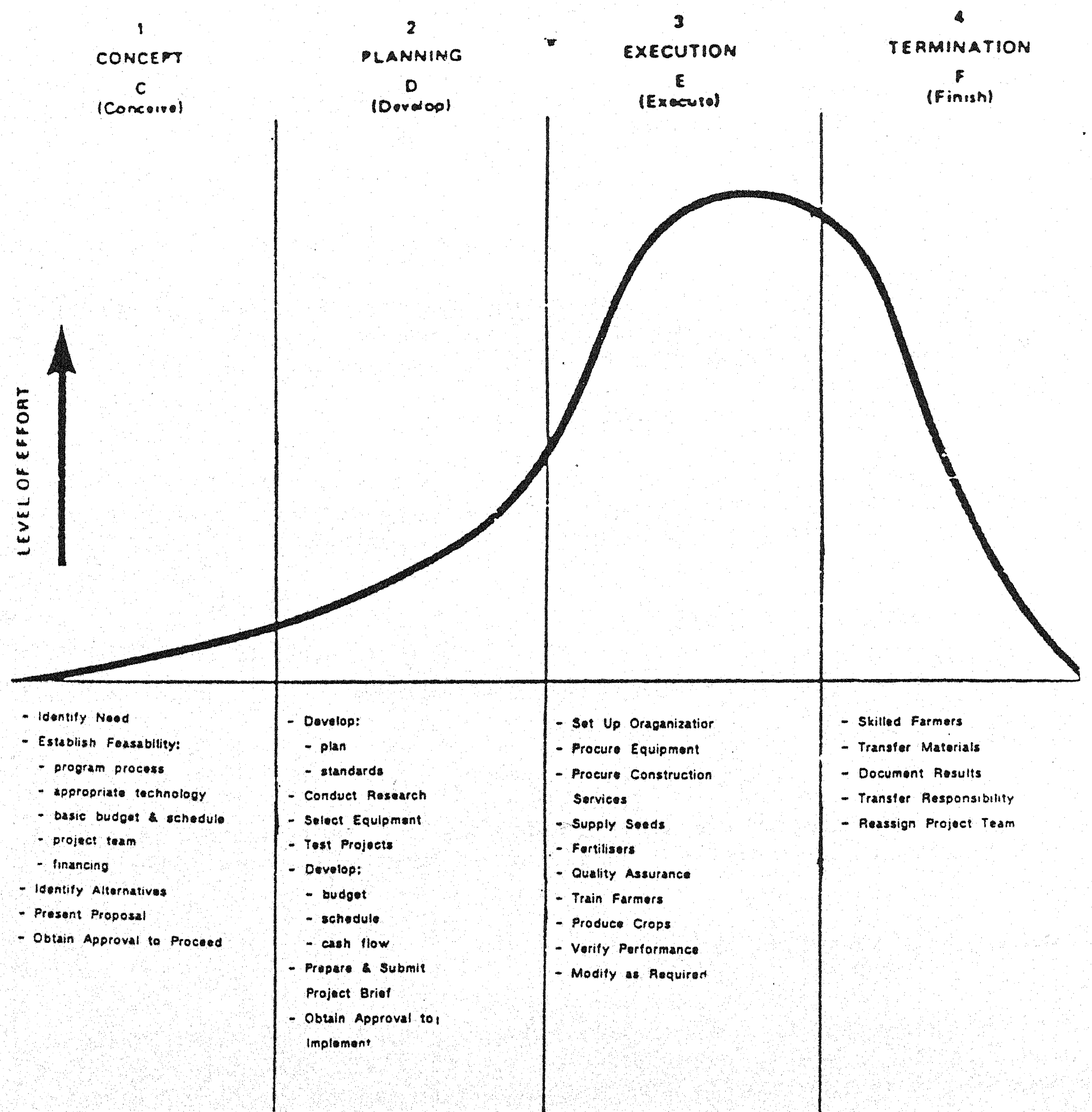


Figure 2

PROJECT LIFE CYCLE: FOUR BASIC STAGES

fig 3

COMMUNICATION MANAGEMENT

SYSTEMS

- DOCUMENTS
- POLICIES
- PROCEDURES
- STANDARDS
- FUNCTIONS

MEETINGS

- PROBLEM SOLVING
- ANALYSIS
- DECISIONS
- PROGRESS
- OBJECTIVES
- REPORTS
- INSTRUCTION

PERSONAL

- SKILLS
- ON THE JOB
- FARMERS
- ADMINISTRATION
- SCIENTISTS

TIME MANAGEMENT

PLANNING

- PROJECT OBJECTIVES
- POLICIES
- BREAKEDOWN & LOGIC
- ESTIMATING
- ANALYSIS

SCHEDULING

- REAL TIME
- REAL RESOURCES
- ANALYSIS

MONITORING

- DATA COLLECTION
- PROGRESS/PERFORMANCE ANALYSIS
- REPORTING

CONTROL

- EVALUATE
- DECIDE
- DIRECT

FIGURE 3
COMMUNICATION MANAGEMENT FUNCTION
TIME MANAGEMENT FUNCTION

MACHINERY AND INPUT MANAGEMENT

MACHINERY

- SOURCES
- TYPES & SELECTION
- APPLICATION
- USAGE PLANNING
- PRODUCTIVITY
- MAINTENANCE
- MODIFICATIONS
- NEW APPLICATIONS
- PERFORMANCE SPECIFICATION
- LOGISTICS
- PERFORMANCE ACTUAL

INPUTS

- SOURCES
- COST & VALUE
- PROCUREMENT
- SPECIFICATION
- QUALITY CONTROL
- PERFORMANCE
- LOGISTICS

QUALITY

PRODUCT

- ALTERNATIVES
- TRADE OFFS
- SPECIFICATIONS
- PERFORMANCE

DESIGN

- TECHNICAL
- PRACTICAL ASPECTS
- PRODUCTION
- SUPERVITION
- COORDINATION

IMPLEMENTATION

- ORGANIZATION
- ALTERNATIVES
- INSPECTION
- TESTING
- TRIALS

SERVICES

PROJECT MANAGER

- ORGANIZATION
- TIME
- COST
- ACCOUNTING
- DOCUMENT-ATION
- CONTRACTING
- QUALITY CONTROL

TEAM

- FARMERS
- CONSULTANTS
- CONTRACTORS
- SUPPLIERS
- EXTERNAL AGENCIES
- SCIENTISTS

FIGURE 4
MATERIAL MANAGEMENT FUNCTION
QUALITY MANAGEMENT FUNCTION

SCOPE MANAGEMENT

PROBLEM SOLUTIONS	SCOPE STATEMENT	MONITOR	ANALYSIS	SCOPE REPORT
- INFORMATION DEVELOPMENT	- PROJECT PARAMETERS	- SCOPE DATA	- IDENTIFY VARIANCES	- DATA
- PROBLEM STATEMENT	- TECHNICAL	- MEASUREMENT	- EFFECT ON:	- RECOMMEN-DATIONS
- CRITERIA	- FINANCIAL	- COMPARISON	- POLICY	- WRITING
- ALTERNATIVES	- SOCIAL		- PLAN	
- SOLUTION			- BUDGET	

HUMAN RESOURCES MANAGEMENT

PERSONNEL	ORGANIZATION	INDIVIDUAL FARMER
- POLICIES	- STRATEGY	- TRAINING
- BENEFITS	- DEVELOPMENT	- FUTURE PLANNING
- REWARDS	- MANPOWER PLANNING	- PRODUCTIVITY
- RECORDS	- TEAM MANAGEMENT	- TEAMWORK
- LABOUR RELATIONS		

FIGURE 5
SCOPE MANAGEMENT FUNCTION
HUMAN RESOURCES MANAGEMENT FUNCTION

COST MANAGEMENT

PROJECT SCOPE	BUDGET	SPENDING	CONTROL	MONITOR	COST BENEFIT EVALUATION	POST PROJECT EVALUATON
- PRESENTATION - ACCEPTANCE - TECHNICAL - REPORT - WORK PACKEGES	-INTERPRET SCOPE -PREPARE CONTROL ESTIMATE	- PAST PERFORMANCE - REVIEW BUDGET SCHEDULE WORK PACKAGES - FORECAST COMMITMENT SPENDING	- STANDARDS - PROCEDURES - ACTION	- STANDARDS - PROCEDURES - ANALYSIS & REPORT	- ANALYZE - OPTIMIZE SPENDING	- ANALYZE - COST - SCHEDULE - R.O.I - BENEFITS - FUTURE RECOMMENDATIONS

FIGURE 6
COST MANAGEMENT FUNCTION

Systems Concepts

Project management relies very heavily on the science of management systems.For example,Decision Analysis is a methodical and logical process of evaluating information,predicting the future, evaluating and comparing alternative courses of action, and selecting the best course to achieve the stated objectives. The project manager should always examine and re-examine the decisions by answering basic questions like what, when, who, how, how will, how much etc.

Rapid Reaction to Changing Environment

A good project manager must also recognize, react and exploit unexpected changes to the advantage of the project.

Project Organization

Overall responsibility for a project must rest with the project organization, which must be results oriented.This central organization or group must be capable of delegating and motivating. This is especially important when other functional groups are required to contribute to the project, but whose primary responsibility is elsewhere.

3.2 - Features of the project Management Organization

A project Management Organization should be a central clearing house established for timely project decisions which involve diverse interests. It must pull together such diverse activities as feasibility studies, farmer motivation, local authority requirement, design, construction, startup, etc. All of these activities are time -phased over the life of the project, and all require coordinated planning, scheduling and control.

Private farmers investing in capital works can deal more effectively through a single organization that assumes overall responsibility for feasibility, scheduling, design, procurement and delivery. In turn, the project manager in charge of such an organization will be able to interpret the farmer's requirements and direct and integrate the various specialists' efforts in diverse disciplines. This enables the private owner to continue to concentrate on his primary business with minimal dilution of effort. But in large governmental organisations dealing with the public, the approach has to be different the amount of coordination and communication should be of a very high order. The project Manager, in turn, must look at the overall project with out being influenced by,say,the specialist's bias or the profit motive as he has to look at it from the nations angle.

An effective project management organizational structure, together with management techniques should bring about a logical approach and facilitate decision making. Managerial unity should be established within an otherwise functional organizational structure.

Project scope and complexity frequently dictate the need for a formally structured Project Management System. This is necessary to balance design, construction, schedule, cost and human resources; and to synchronize activities in terms of time, cost and place. Human and nonhuman resources must also be coordinated and integrated. Through such a project management organization,we can achieve control of the project from the beginning.

3.3 - Project Manager's objectives

It follows from the foregoing that the project manager's objectives must be to

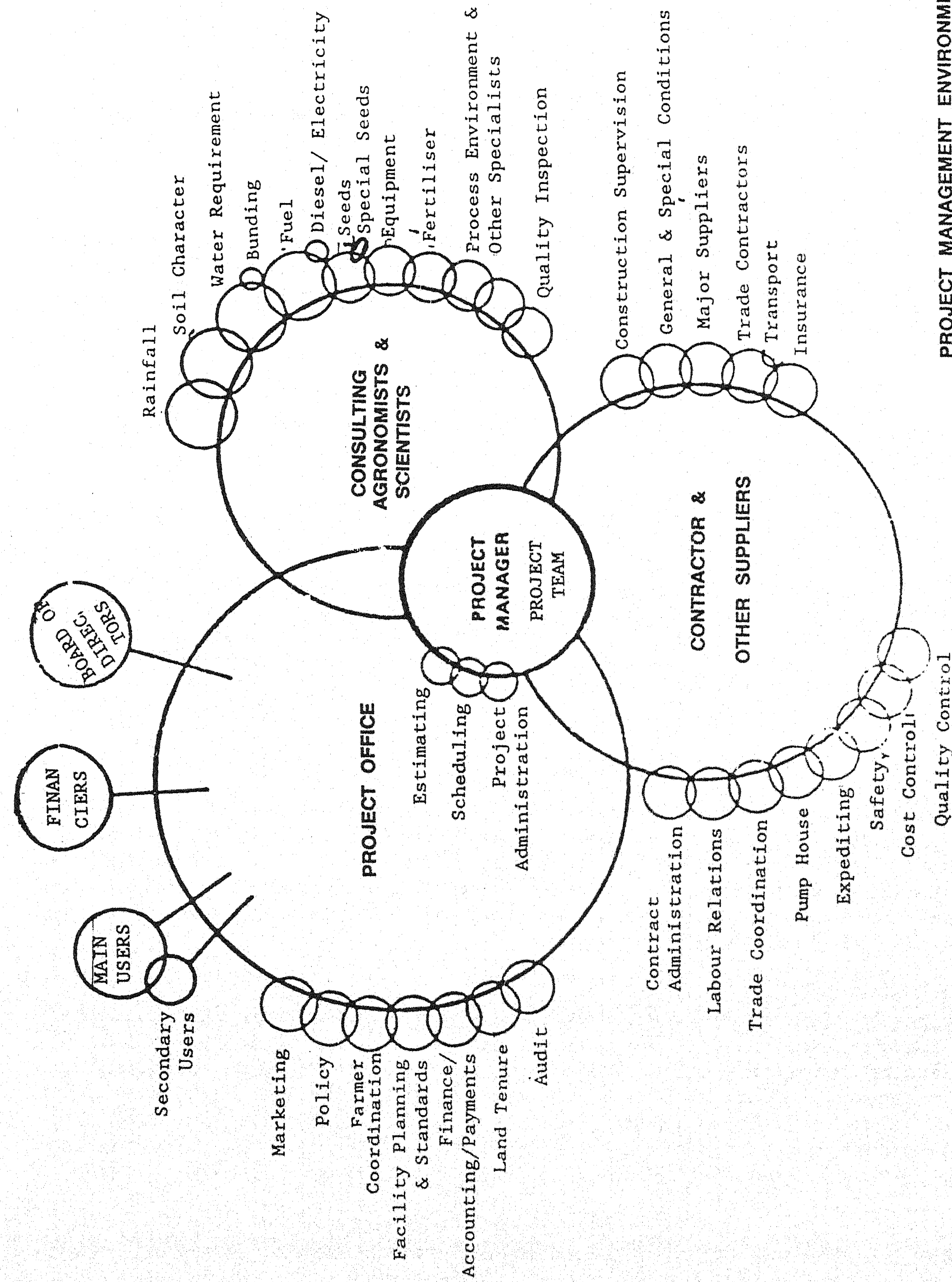
- attain the willing commitment of personnel assigned to tasks;
- achieve the coordination and collaboration of different work groups, responsibility centers,and entire organizations;
- achieve cooperation by placing a high premium on reliability and timeliness of information, and by discouraging unnecessary or irrelevant information;
- Steer the project to completion in an orderly and progressive manner;
- ensure that trade-offs between scope, cost and time are satisfactory and acceptable;
- perpetuate development of personnel and professional skills and the potentialities of project participants.(farmers).

3.4 - Project Manager's Environment

In any capital project, the project group to be managed will consist of consultants,contractors, scientists, the officials of the head office and the project management organization. (see Figure 7) Each person or unit in the group often has two 'bosses', the project manager and his own 'home' department. This dual reporting relationship is often referred to as a 'matrix' structure (discussed later).

The project manager will be required to direct operational activities such as design, procurement, and construction. He will state his requirement for such management support activities as estimating, scheduling, accounting and forecasting.

figure 7



PROJECT MANAGEMENT ENVIRONMENT

In addition, on a larger project, he will require other more specialized services such as financial accounting, payroll, systems development, personnel, legal, public relations and property acquisition. Because they do not normally affect project control decisions, these activities are usually carried out by others, not directly under the project manager's supervision.Nevertheless, if the project manager is to get the quality of information and service that he needs, he must maintain good relationships with all such parties.

The project manager will also be required to report to senior management on a regular basis. For this he must prepare reports of the available information on progress, forecast, resource requirements, and actions required.

By comparison, top management's interest will tend to focus on expenditure to date, forecast, final cost, and the scheduled commencement of an operating cash flow.

4. - PROCESS OF MANAGEMENT CONTROL

4.1 - Plan, Organize, Execute, Monitor and Control

The basic process of management control can easily be remembered by the mnemonic POEM standing for Plan, Organize, Execute, Monitor and Control.

Plan - The first step is to plan the project with respect to scope, time and cost. What precisely is to be done? Why? If it is, say land development, what is the purpose and process? How is the job to be done? Why should the project be done one way rather than another? Indeed why should it be done at all? Where is it to be done? Who will design the modality? What resources in terms of materials, manpower, finances and time are required? What risks are involved? What strategies are required to deal with unplanned occurrences?

Organize - The second basic step is a extension of the planning process. A careful analysis must be made of the various activities required in planning structure. For every project activity (e.g. programming, estimating, design, planning, procurement, construction) there must be a very clear definition of who is responsible, and who has the authority to execute the activity. That person must have a very clear definition of the scope, cost and time budget for that activity.

Execute - The methods by which the plan is executed or implemented are critical. No project manager (or other member of the project team) will be successful unless he understands the basic needs of human beings, their strengths and weaknesses, mental and social abilities, and how to weld a complex mixture of humans into a dynamic and productive team. The

single most important characteristic of a successful project manager is his ability to manage people.

Monitor and control - Continuous monitoring, reporting and forecasting must take place during project implementation, and the forecasts should be compared to the present reallocation of resources or modifications to the Plan. Without a detailed Plan, there is no basis for comparison, and analysis of deviation. Therefore, there is no satisfactory basis for corrective action. Clearly then, a successful project management system is one which monitors and responds by a control action as early as possible after an event.

Figure 8 demonstrates the process of management control by outlining the general activities which may be expected within each element of the process in various agricultural project management situations.

4.2 - Elements of Control

The science of systems can be applied to project management. In a simple machine-to machine system such as an air conditioner, the input is the electric power and the output is cold air. We need three essential control tools.

- a monitoring mechanism, in this case a thermostat
- a comparative device, e.g., the thermostat signal with a set point or objective, and
- a preset formula and a means for sending a corrective signal.

The preset formula and corrective signal in its simplest form is on-off. Obviously, other more sophisticated formulae and signals are possible. This can be seen in a man-to- machine system such as an automobile where graduated control is exercised by the gas and brake pedals.

Project Management is a man-to-man system. In this case the input is essentially the design, planning, materials and labour. The output is a completed project. The processing is done by scientists, technicians, farmers, skilled labor, etc.

Control is exercised through monitoring, reporting and forecasting the output, comparing actuals to the project objectives and sending corrective signals to the input of data and resources. Thus the output is made to conform closely to the objectives. (See Figure 9.)

FIGURE

PROJECT MANAGEMENT IN VARIOUS SITUATIONS MANAGEMENT

PROJECT SITUATIONS

PROJECT CYCLE	R&D	NEW VENTURE	RURAL DEVELOPMENT		TURN AROUND
OBJECTIVE	CONDUCT RESEARCH AND DEVELOP A NEW SEED/TECHNIQUE	SUCCESSFULLY LAUNCH A NEW METHODOLOGY	DEVELOPMENT AND IMPLEMENT A RURAL DEVELOPMENT PROGRAMME	DESIGN AND CONSTRUCT A A PHYSICAL FACILITY (GODOWN)	WITHIN A DEFINED TIME PERIOD, TURN A POOR PERFO-RMANCE SITUATION INTO A SUCCESSFUL ONE.
STRATEGY PLANS Plans for:-	Strategy for: - Investment - Timing - Research Direction - Staffing - Investment - Review points	Strategy for: - Product credit - Marketing - Plans for: - Financing - Production - Supplies - Pest control	Strategy for: - Financing - Development - Social development - Technical approach Plans for: - financing - Social Dev. - Technical Dev. - Implement-	Strategy for: - Financing - Contracting - Technical Aspects - Timing Plans for: - Financing - Schedule - Technical Development - Contracting	Strategy for: - Capitalizing on existing strengths - Investment of resources Plans for: - Investment - Staff utiliza-tion - Performance - Schedule and major review points.
ORGANISATION	Transition Organisation - R&D group maintain linkages with other scientists & farmers Objective organisation: No objective organisation	Transition Organisation - organisation - development with major technical, financial and farmer groups. Objective organisation: - operate enture - after start up.	Transition Organisation - Core group to interface with Govern-ment residents special agencies etc. Objective organisation: - post develop-ment, social organisation to continue to deal with social impacts.	Transition Organisation - Condition of officers - liaison with future users Government etc. - Transfer to owner farmer. Objectives Organisation - No objection Organisation	Transition Organisation - requires clearly defined charter and control over resources. - Establish objective organisation assume operations after turn around is complete.

Contd...

PROJECT CYCLE	R&D	NEW VENTURE	RURAL DEVELOPMENT		TURN AROUND
IMPLEMENTATION	- Must ensure continuous linkages between R&D functions -'Go/No-Go' design on development is critical and requires input from other units in organisation	- coordination with support units must be maintained - transition from development to cooporation is critical.	- Monitor and reduce the impact of social and financial disruptions	- Coordination of a great number of organisations and individuals to ensure schedule completion - control expenditure to avoid overruns.	- establish among transition staff - ensure acceptance by other organisation - closely track performance with schedule.
CONTROL	- Control of: - Technical progress costs - revenue forecasts - schedules for each phase and linkage between phases.	- Control of: - Technical - performance - operational preparadness of back-up units - schedule - progress - costs - revenue projections	- Control of: - Technical progress - schedule costs - funding or financing.	- Control of: Technical progress - Schedule - Costs - revenue - Key schedule events and milestones.	- Control of: - Financial investment and projected revenue - Technical performance - Technical resources and personnel employed

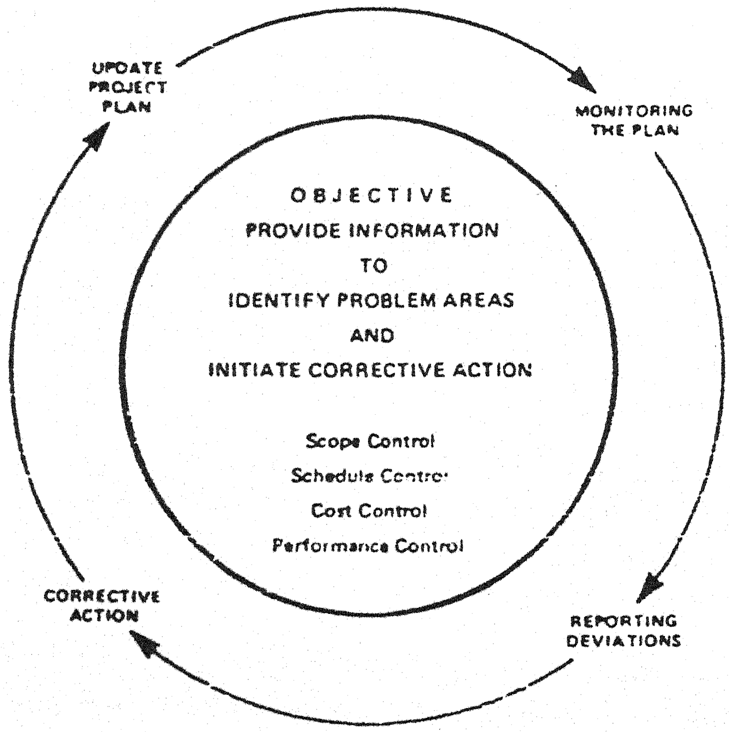


FIGURE 9
THE CONTROL CYCLE
ELEMENTS OF CONTROL

	FARMER CONTRAINT (REQUIRE-MENTS)	EXTENSION (CODES & BY-LAWS	CREDIT (ACCEPTA-BILITY)	MARKET CONSTRAINT	
INPUT	MANAGEMENT PROCESS	TECHNOLOGY PROCESS	CLIMATE PARAMETRES	PROCUREMENT	OUTPUT
	MONITOR REPORT FORECAST				

FIGURE 10
PROJECT MANAGEMENT SYSTEM

Actually, the real process is continuous and even more complicated. The cycle of monitoring, comparing and correcting never ceases until a project is completed. (See Figure 10.)

4.3 - Characteristics of a Good Management Control System

- It must facilitate detailed planning.

- It must be able to measure performance in relation to the plan and quickly report any deviations from the plan.

- It must identify unforeseen changes and communicate.

- It must be able to communicate planning and performance information to all parties involved.

- It must identify objectives and highlight important operations leading to these objectives.

4.4 - Work Breakdown

- When planning, the project manager divides the project into activity or work packages. (arranging credit, seeds, inputs etc.)

- The activity or work packages are designed to be handled by individuals wholly within functional groups. Activity packages must not cross functional groups.

- Each package has a clear objective in terms of scope, cost and time.

- Work proceeds on each activity package with regular reviews to ensure that it is maintained within scope, cost and time.
- Commitments are automatically made when the completed activity package is within scope, cost and time budgets as defined in the plan.

- If an activity package is outside the plan of scope, cost and time, the project manager may request reallocation, additional resources, or redefinition of the plan.

4.5 - Work Breakdown Structure

In dividing the project into separate packages,a hierarchical structure should be adopted. (See Figure 11.)

fig 11

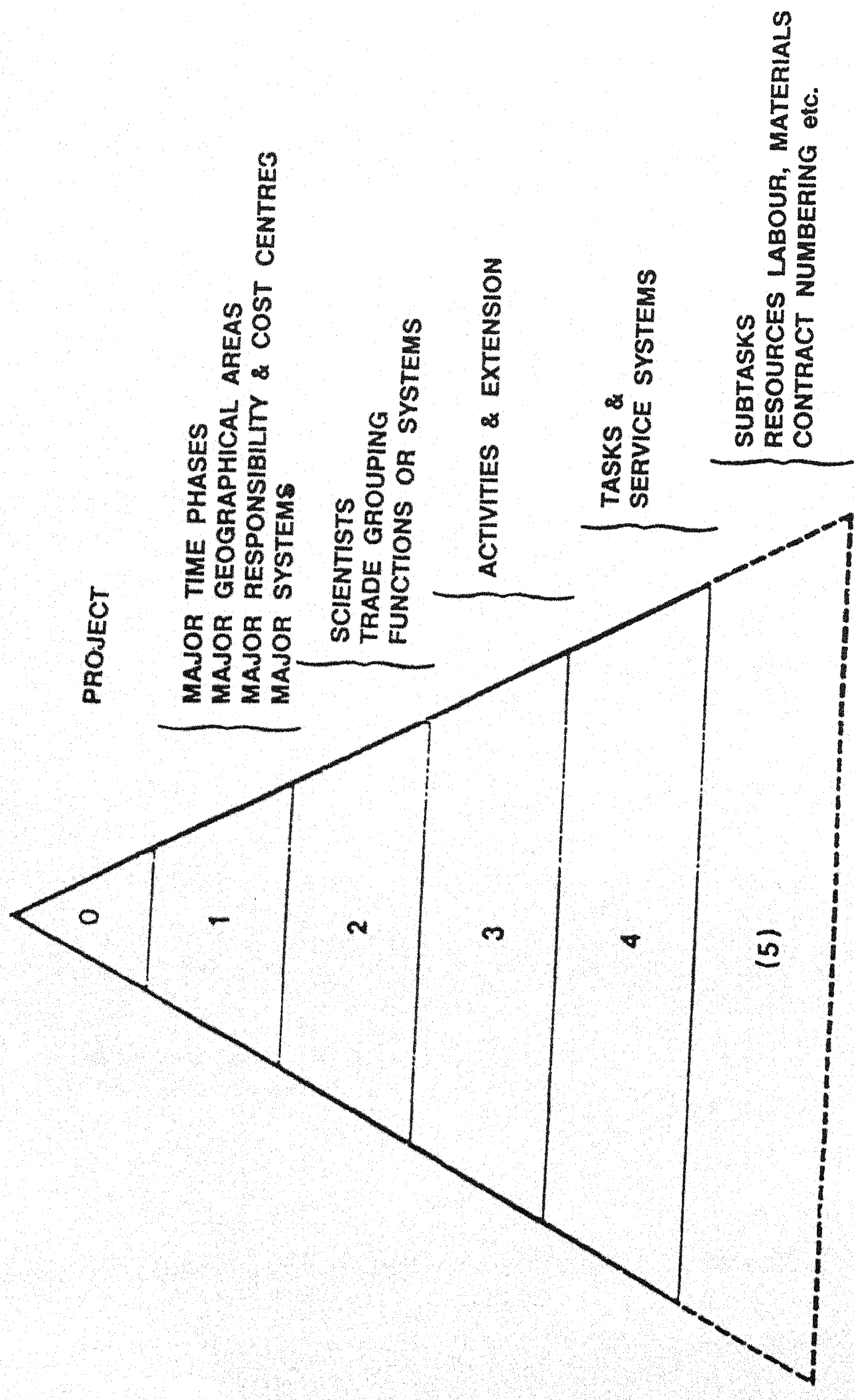


Figure 11

THE WBS PYRAMID

Thus, the Work Breakdown Structure (WBS) becomes a task oriented 'family tree' of activities, which organizes, defines and graphically displays the work to be accomplished. A WBS must

- establish an information structure for describing the project
- serve as an effective means of communication
- represent the planning of the project, step by step
- separate sequential and parallel activities assigned to different groups who will schedule, measure and control their own performances, and
- reflect the procurement (fertilizers, seed, cement etc.) strategy during construction and operations.

4.6 - Work Packages

The activity or work packages described earlier are usually referred to as 'Work packages'. All work packages fall into one of three different categories

- Discrete tasks which have a specific end result or objective. These normally cover 60 to 75 percent of the total work in a project.
- There are certain (Level of effort) tasks which do not have specific end results. These consist mainly of the overhead accounts, e.g., management, administration, liaison, coordination, etc. These tasks are characterized by relatively time-phased budgets and are not time-limited as in the case of the discrete tasks.
- Apportioned-effort tasks which can be directly related and apportioned to discrete tasks.Example include quality control or inspection. These tasks are required in support of the discrete tasks, and hence, their schedule and budget can be related to the discrete tasks.

A work package is a generic term describing unit at the lowest developed level of the relevant part of the WBS. The distinction is made between the lowest developed level and the lowest possible level, because at any given time not all work packages will be classified at the same level. In other words, a work package is not a distinct level in the Work Breakdown Structure.

4.7 - Work Package Rules

A work package describes the work to be performed by a specific organizational unit, and serves as a vehicle for monitoring and reporting

on progress, cost and schedule. To be effective, work packages should be controlled by the following rules.

Rule 1: A work package must represent a unit of work at a level where work is performed.

Rule 2: It must be clearly distinguishable from all other work packages.

Rule 3: It should have scheduled start and completion dates.

Rule 4: It should have a budget.

Rule 5: Its size and duration should be limited to relatively short spans of time.

Rule 6: It must integrate with other work packages and schedules.

Rule 7: It must represent a level at which actual costs can be collected or assigned.

However, that a project should not be broken down to too great an extent. If some work packages are too small, unnecessary administrative effort will be expended in maintaining the information flow. This suggests some additional rules governing work packages

Rule 8: On small projects the following 'test of reasonableness' is suggested.

A work package should at least be large enough to constitute a scope of work that could be competitively bid and contracted for by itself.

Rule 9: On large, multi-crore projects design work packages should not be less than, say, 300 manhours and 2 months in duration.

For construction, a minimum work package value of, say, 0.1 percent is a good rule of thumb.

A number of small work packages may be assembled into a big package for job allocation purposes. Within such a group, the identity of the individual work packages should be maintained for control purposes. However, to be consistent with the work package definition, the following rule must be applied.

Rule 10: The same work package may not appear in more than one contract. If this is likely to happen, the affected work package should be subdivided, and the respective parts separately defined and coded.

5. - ORGANIZATIONAL STRUCTURES

5.1 - Organization at Executive and Project Levels

Typical Oraganization

The following two figures depict the traditional organisation structures at the executive and project level. It is seen from the two figures that there is no coordination or integration. Therefore, a matrix organisation should be established.

TYPICAL PROJECT SET-UP

STRUCTURE 1

```
                       -------------
                       :  CHIEF    :
                       : EXECUTIVE :
                       -------------
                             :
                             :
                             :
          ---------------------------------
          :                  :                :
          :                  :                :
          :                  :                :
      ---------       ------------     ------------
      : FINANCE :     : EXTENSION :    : PERSONNEL :
      ---------       ------------     ------------
```

STRUCTURE 2

```
                         ----------
                         : PROJECT :
                         : MANAGER :
                         ----------
                              :
                              :
                              :
    -------------------------------------------------------
    :                :                 :                :
    :                :                 :                :
 -------------   -----------   -----------------   ---------
 :PROCUREMENT :  :SCIENTIST:   :  CONSTRUCTION  :  :EXTENSION:
 -------------   -----------   -----------------   ---------
```

5.2. - Matrix Organization

Matrix Project Organization

This is a multidisciplinary team whose members are drawn from various functional units of a hierarchical organization. This team is temporary, since it is built around the project.

In a matrix organization, there are usually two chains of command: one along functional lines and the other along project lines. (See Figures 12 and 13) Other chains of command such as geographic location are also possible. The project manager's role may vary from a very strong managerial position to a simple coordination one. It should also be noted that project personnel have two bosses.

Why Matrix?

The matrix organization has been evolved in response to the need for a structure that would enable the manager to manage very large and complex programs, projects and problems, as well as facilitate management of limited resources. In a large organization, functions and skills are fragmented throughout the organizational structure. Individual functional departments often fail to view the total system and tend to solve the problem within their particular discipline.

Balance of Power

Theoretically it should be possible to divide the authority and responsibility more or less equally between the project and functional managers. The functional manager represents 'home base' where the employee returns after the project is completed. Also, the functional manager normally carries the most weight when it comes to performance evaluations and promotions. Therefore he is usually perceived as the real boss. However, some employees relate so strongly to the overall project that they perceive the project manager to be the real boss. Thus there may be a continually shifting balance of power.

Making the Matrix Work

Top management must give real and immediate support to the matrix, including a clear project charter stating the purpose of the project and spelling out the responsibilities and authority of the project manager. Functional management must accept that the project comes first. Project managers need to become 'negotiation experts', in order to obtain concurrence of the involved functional managers. Project personnel must be able to adapt to the two-boss situation.

fig 12

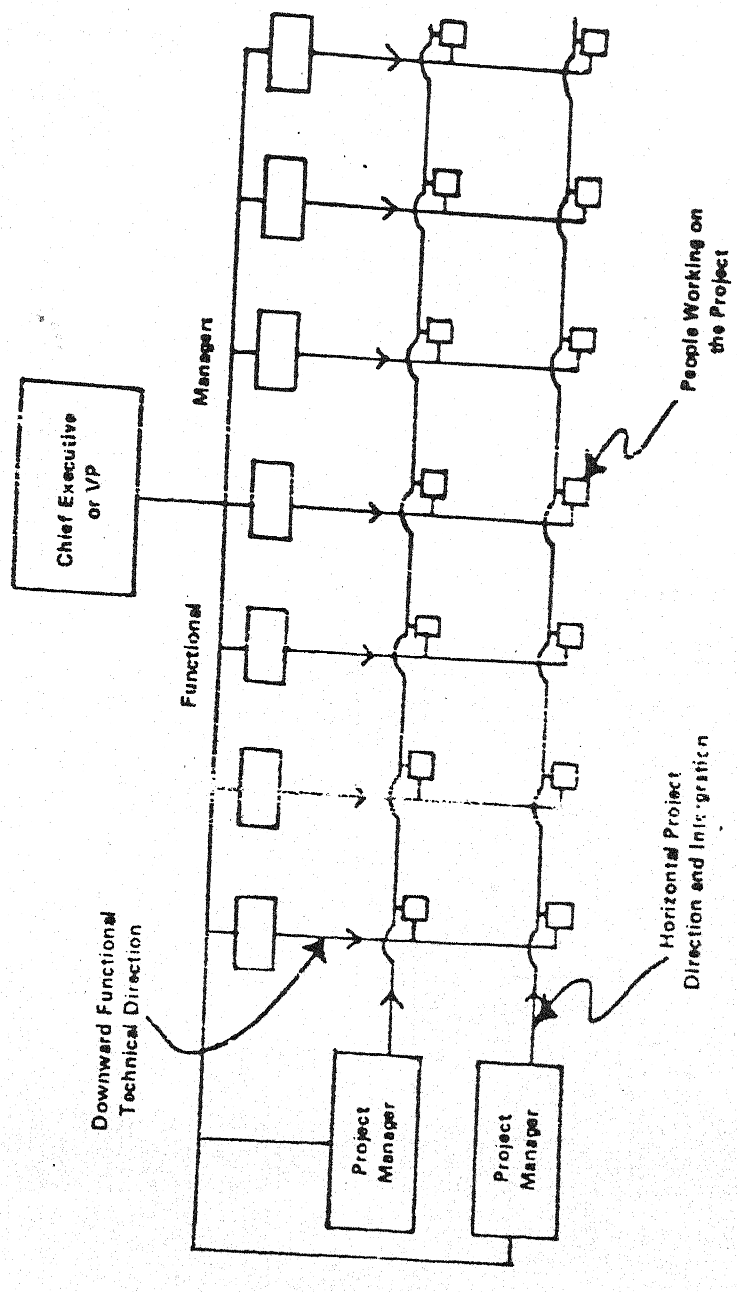


Figure 12
SIMPLE MATRIX ORGANIZATION

fig 13

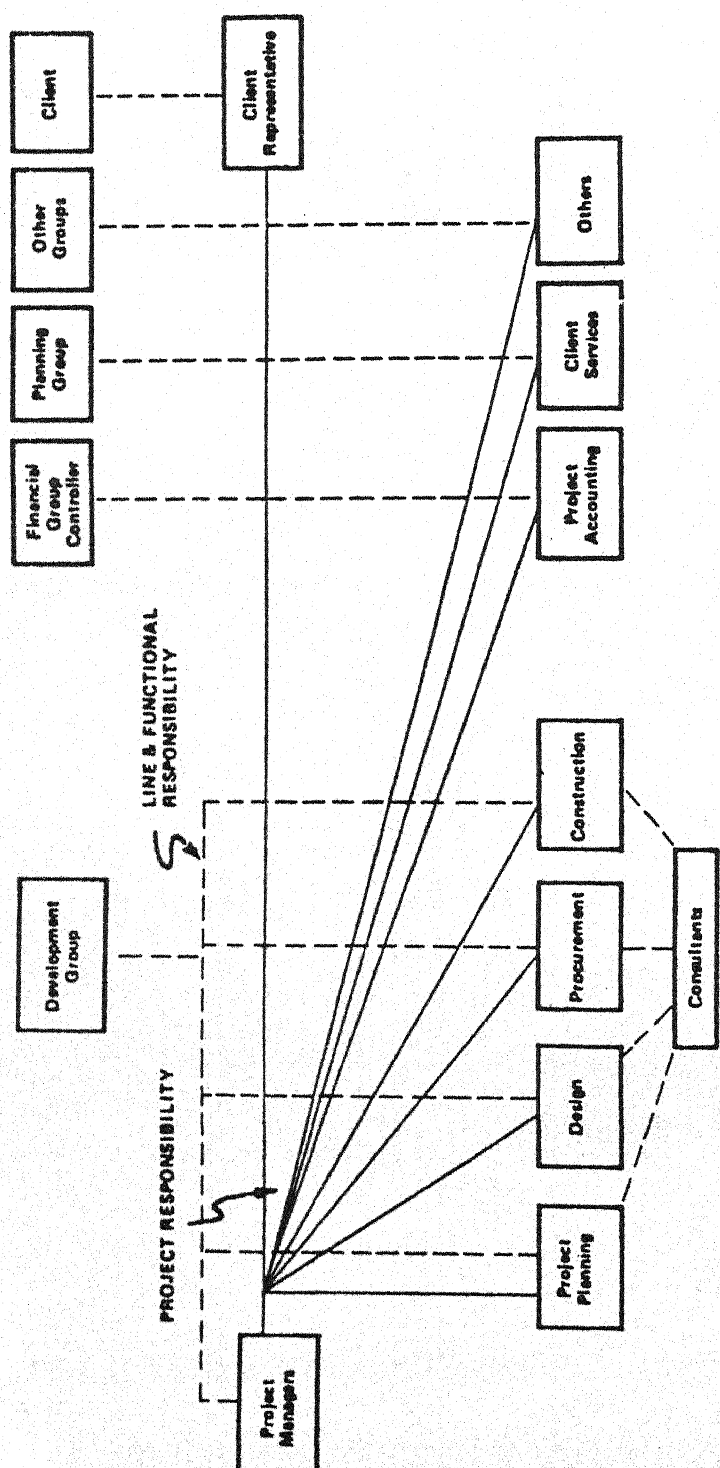


Figure 13

ORGANIZATION OF FUNCTIONAL GROUPS IN An ORGANIZATION

5.3 - Function Vs Project Relationships

Project/ Function Interface

The organization structure employs a mix between task and result - oriented project management teams, and functional departments (such as planning, estimating, procurement, and project accounting) which provide expertise and work forces.

There is a natural conflict situation since many of the goals and objectives of project and functional management are different. Cooperation and negotiation are the keys to successful decision making across the project/functional interface. The project manager must depend on the cooperation and support of functional managers.

Strong Vs Weak Matrix

Sometimes a balance of power may not be desirable. A project may be so important to the organisation, or the budget and schedule so tight that top management feels that the project manager must be in a very strong position. It has been found that a strong project office is often necessary to achieve good project performance. The balance of power can be tilted in either direction by changing any one or a combination of the following factors (see Figure 14).

- administrative relationship (reporting levels)
- the physical relationship (distance)
- the time spent on the project.

Project Manager's Responsibilities

As noted earlier, the overall integration of the total project system requires the project manager to ask

- What is to be done?
- When will the task be done?
- Why will the task be done?
- How much money is available to do the task?
- How well has the total project been done?

fig 14

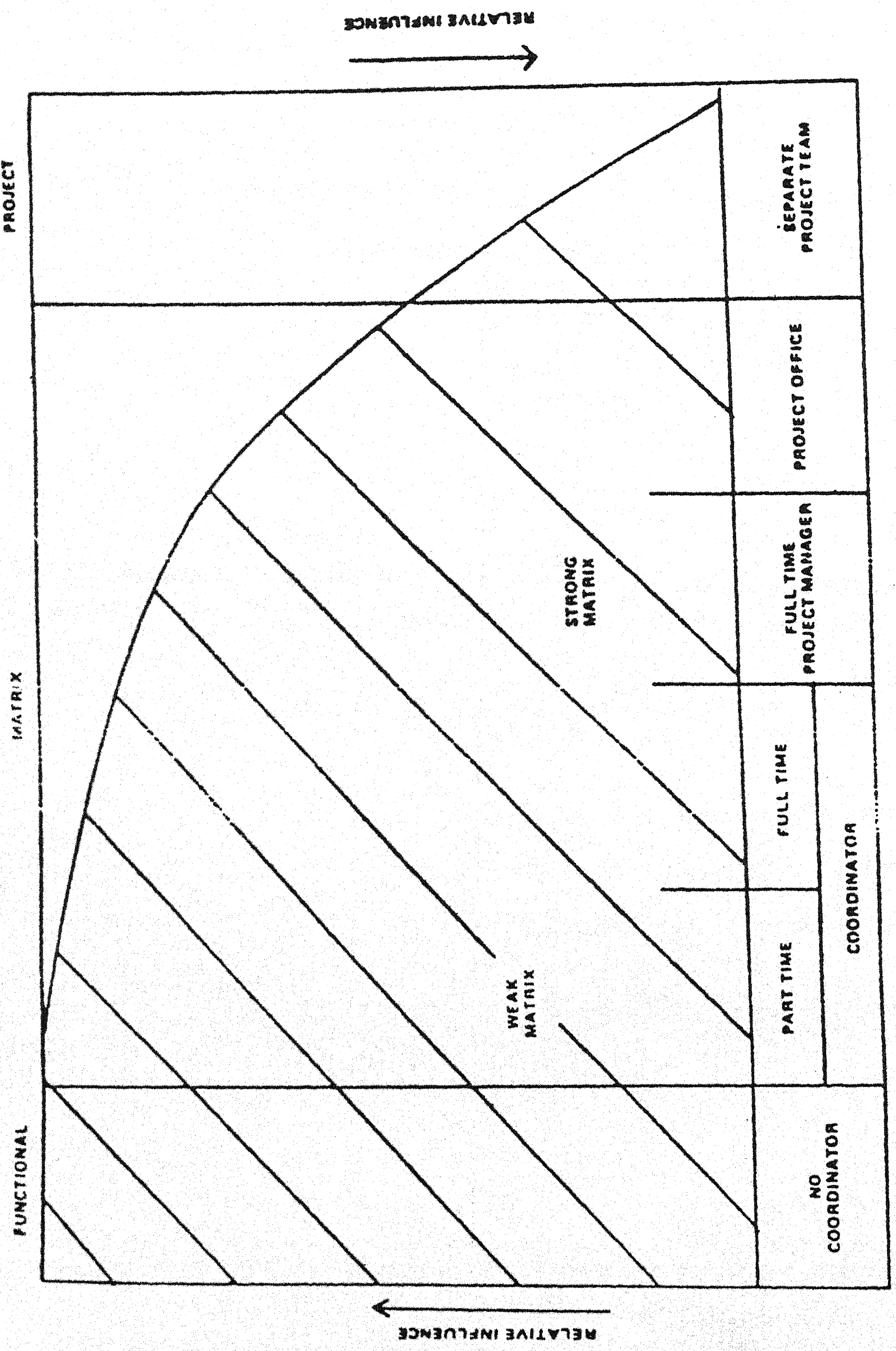


Figure 14
RANGE OF ORGANIZATIONAL CHOICE

Functional Manager's Responsibilities

The technical manager is responsible for the direction of his function - for example, supplying fertiliser

- How will the task be done?
- Where will the task be done?
- Who will do the task?
- How well has the functional input been integrated into the project?

5.4. - Responsibility Chart

A Responsibility Chart is often more meaningful than an organization chart or job description, particularly when it is filled in at a meeting of all concerned, and with the agreement on respective responsibilities.

AN EXAMPLE IS SHOWN BELOW.

	Actors				
Decisions	Chief	Scientist	Project Manager	Manager Extension	Finance
Allocate Manpower	R	C	A	C	I
Change in Training	A	C	I	R	I
Change in Budget	A	I	R	I	C
Change in Schedule	A	C	R	C	I

Legend: R - Responsible
A - Approve
C - Consult
I - Inform

6. - FUNDAMENTALS FOR SUCCESS

6.1 - Executive Control Points

Every project should have 'Executive Control Points'. For top management, these points provide the opportunity to exercise a high level of control over the shapes and timing of the project. Top management can ensure that either the project is developing in a manner consistent with their objectives, or the project can be modified with minimum upset if the objectives have changed.

These control points provide the project manager with a mandate to drive the project through to the conclusion of the ensuing stage. It is the project manager's opportunity to ensure that top management is behind him and that he is proceeding in the right direction.

Changes and related delays may cost much more during implementation on construction, than they will if made during the planning stage. Therefore, at the beginning of the project, Executive Control points should be established for the conclusion of each stage, on a 'go' or 'no-go' basis for further work.

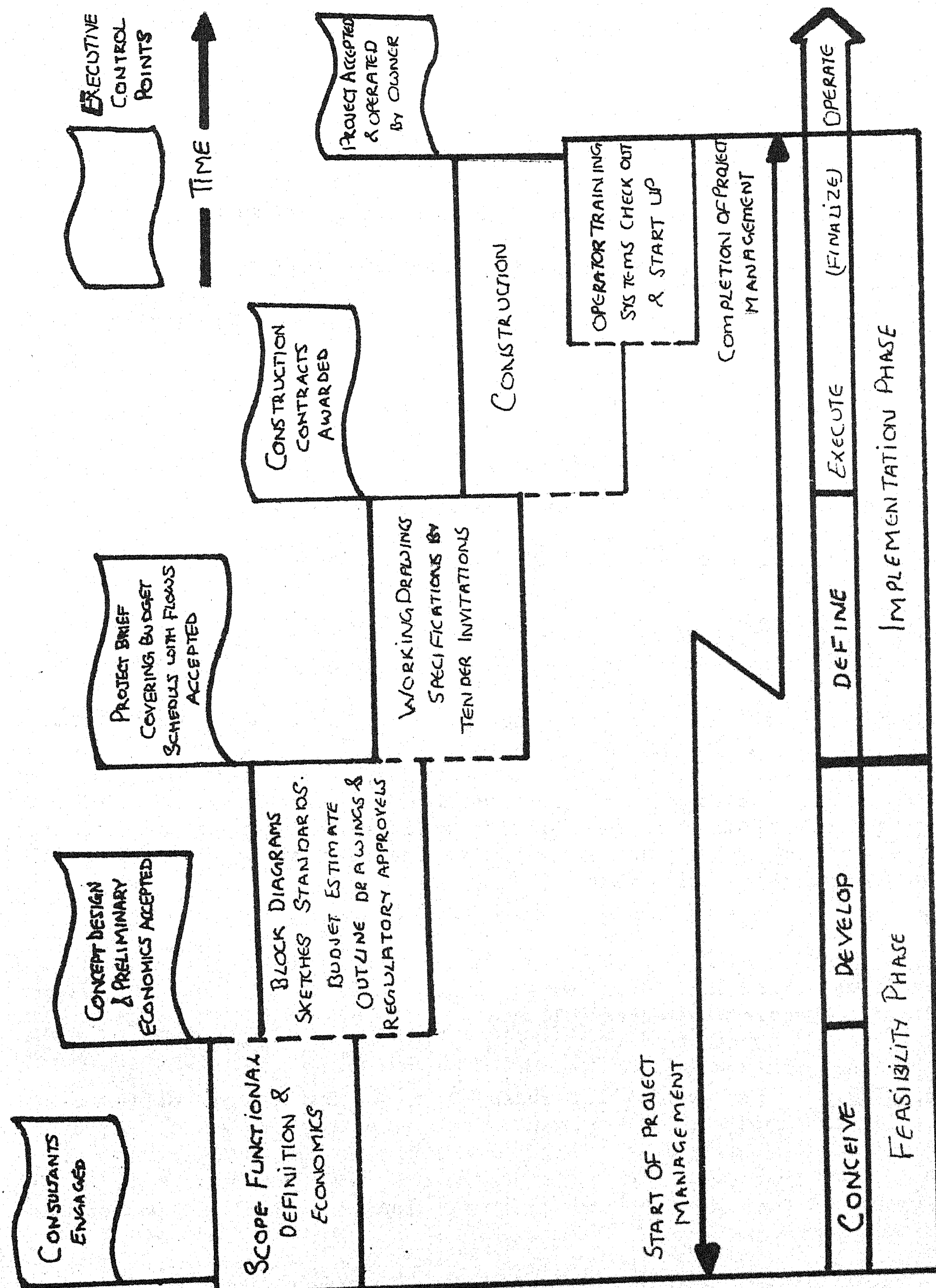
The most important control point in the project life cycle is reached at the conclusion of the concept development stage. The end of this stage marks the transition of the project from the feasibility phase to the implementation phase. At this point, a project 'go' decision must be based on sound and well documented scientific information. This information should be presented in a comprehensive document referred to as the Project Brief. The Project Brief, when approved, becomes the prime source of reference for the implementation phase (See Figure 15.)

6.2 - Project Brief

The Project Brief is the means whereby the organisation knows precisely what it is getting. A good Project Brief will include.

- executive summary
- general statement of business aims and objectives
- technical approach - technology
- statement of project scope - coverage geographical and others
- regulatory approvals and requirements - land tenure

fig 15



Executive Control Points
Time
Consultants Engaged
Scope Functional Definition & Economics
Concept Design & Preliminary Economics Accepted
Block Diagrams Sketches Standards. Budget Estimate Outline Drawings & Regulatory Approvals
Project Brief Covering Budget Schedules with Flows Accepted
Working Drawings Specifications by Tender Invitations
Construction Contracts Awarded
Construction
Operator Training Systems Check Out & Start Up
Project Accepted & Operated by Owner
Start of Project Management
Completion of Project Management
Conceive
Develop
Define
Execute
(Finalize)
Operate
Feasibility Phase
Implementation Phase

- preliminary design sketches, block diagrams, standards - quality seeds, fertiliser and pesticide standards
- Project team organization
- implementation schedule - Calender dates
- procurement plan - for input supplies and investment
- project estimate and proposed appropriation budget
- other resources required from the sponsoring organization (e.g. land, space, staff, etc.)
- financial statement and economic projections
- cash flow projection
- justification, alternatives - mechanical Vs manual
- areas of uncertainty and risk - climatic, credit

Evolution of a Project

Long Range Plan - The first linking of a capital project should normally occur during the preparation of a Long Range Plan. At this point, an operating group, department, or corporation, will identify a need or opportunity. The Long Range Plan should not only define an objective in very general terms, but also specify actions required to more clearly define the objectives, and substantiate the need or opportunity in the planning for the ensuing year.

Annual Plan - By the Annual Plan stage, the needs, opportunities and objectives will have been more clearly identified, and a project feasibility phase will be established.

Feasibility - The Feasibility Phase of a project is the defining and planning and is the most important from the point of view of return-on-investment. It should set the foundations for all future controls on scope, cost and time. A project manager should be appointed at the beginning of this phase to coordinate the inputs of the various business and technical function.

This phase should result in a report and recommendation which, if to proceed, will be the Project Brief discussed earlier.

Implementation - Approval of the Project Brief triggers the Implementation Phase. Utilizing the plans prepared in the Feasibility

Phase and description in the Project Brief, the detailed design procurement and construction process commences.

Start-Up and Operation - This represents the commencement of the project and start of useful and productive life of the capital facility.

7 - ORGANIZATION REQUIREMENTS FOR SUCCESS

Competence - The Project Manager and his project management organization must be competent.

Internal Authority - The Project Manager must have the necessary managerial authority within his own organization to ensure response to his requirements.

Commitment Authority - The Project Manager should have capability and authority to control the commitment of funds within prescribed limits.

Project Team - The Project Manager should have a say in the assembly of his project Team. Functional and Scientist personnel assigned to the project must also be competent.

External authority - The Project Manager must be identified as the authoritative agent in dealing with outside parties, (farmers etc.) and be the responsible and single formal contact with them.

No major decisions without Project Manager - No major technical, cost, schedule, or performance decisions should be made without the project manager's participation.

Senior management support - Senior management must clearly demonstrate support for the project management concept.

APPROACHES TO THE DESIGN OF AGRICULTURAL DEVELOPMENT PROJECTS[1]

In the planning and implementing of the development programmes it has become a common practice to disaggregate them into separate projects restricted to specified time periods. These projects can be designed and combined in many different ways. The three possible approaches to the design of agricultural development projects are:-

---

1. Adapted from EDI training material by Walter Schafer Kehnert.

1. The Subsector or Product Approach. This is restricted to a subsector of agricultural production, or, in an extreme case, to one agricultural product which covers a broad geographical area. Examples, Coffee, tea, cocoa, rubber, sugarcane, oilseeds, grain, dairy, and meat production projects.

2. The Functional Approach. The effort is restricted to certain development functions like, for example, extension services. The sectors and regions to be covered can be very broad. Examples: agricultural extension, research, rural credit, and market projects; and in a wider sense, project for the development of cooperative systems.

3. The Regional Approach. The effort is limited to a geographically bounded area, within which the tasks are usually broadly conceived. Examples: all types of integrated rural development projects which are regionally defined.

All these approaches have the same goals, that is, the gradual development of the total economy of a country. The subsector approach seeks to involve an ever increasing number of subsectors in the development. The functional approach aims to involve an ever-increasing number of functions. The regional approach implies a commitment to cover more and more regions. The final goal, then, is not at issue here, but only the means to the goal. Of special interest to us the relationship between means and ends.

PROJECTS FEATURES DETERMINING SUCCESS

Until now there have been few comprehensive studies of the chances for success of various project approaches. However, practical experience has identified certain criteria or features of project design which evidently play a decisive part in project success. Among the most important of these are:

1. Simplicity and clarity of the objectives.
2. Availability of an economically attractive technology to promote the product.
3. Integration of the basic production services, especially those of extension, input supply, credit, and marketing.
4. Access to the necessary specialists and provision for the training of needed personnel.
5. The ability to recognize potential constraints and to design contingency plans to overcome them.

6. Compatibility of the project with existing administrative structures.

Compliance with these criteria does not, of course, guarantee project success, since even a well-designed project can fail because of bad management. On the other hand, it is unlikely that a badly designed project can be made successful only through good management.

SUBSECTOR OR PROJECT APPROACHES

The "one product project" is the oldest of approaches. For eg., grains, milk, tea, etc. Today product approaches have come to be broadly defined like dairy products, cattle development. The objective of sub-sector project is relatively clear and simple. They have only one or a small set of related products to be promoted. The integration of farm inputs, supply of credit and marketing services are easily achieved as they relate to only one sub-sector. Here the overhead costs are low and training of personnel is easy since it can be concentrated on a specific technical knowledge.

Since subsector projects may cover broad geographical area, constraints of an infrastructural nature like transportation, inadequate access etc may develop. We may have to create separate administrative structures like special institutions to serve the project, if it has to be successful.

FUNCTIONAL PROJECT APPROACHES

In many developing countries, supplementary services like credit were not well developed, and we now have functional oriented projects like agricultural credit, fertiliser marketing, seed development, and rural marketing projects.

Even though the objectives of functional project approaches seem clear, it does not really define the scope, geographical area etc. It does not also ensure the availability of appropriate technology and this is felt when a broad spectrum of products are taken in hand at the same time. To take an example, a project on credit or extension, does not take into account the integration of basic production services. The ability to overcome bottlenecks becomes difficult. In the functional approach in many cases there is no new institution and therefore in reality, there is no new activity in real terms. In most of the cases, the same officials carry on the extra work thus impeding the project.

REGIONAL PROJECT APPROACHES

One of the best example is an irrigation project. Here some of the problems of sectoral and functional approaches are overcome to a certain extent. Here we can also have multisectoral projects within a demarcated geographical area.

The regional approach can be successful only if we have attractive technologies for a broad assortment of projects. We may have to develop transport, roads, and other services along with a variety of crops. Regional projects are successful only if they are restricted to a few products along with investments in service sector.

The integration of basic input services is usually achieved in this approach, since the project administration can create its own regional services. In cases where they have to depend on others, the project suffers.

It is very difficult to get a specialist trained in all types of activities, therefore a multitude of experts are needed. When the experts leave, the project authorities find it difficult to manage. The strongest point in the regional approach is their ability to recognize constraints. This has contributed much to its popularity.

Attempt to integrate the regional project administrative structure is difficult. Even when the project area coincides with administrative boundaries, the project grows very big, lending itself to be subdivided into a number of subsector oriented projects.

In making a summary comparison of the three project approaches, the criteria previously identified as determining project success are assigned values ranging from 1 to 3 (1 for good, 2 for moderate, and 3 for a poor chance) i.e., that it will influence project success in a positive sense. The results are shown in the following table. The numbers have not been totaled and calculated as average values, since each feature has a very different weight, and the absence of one can completely outweigh the presence of others.

As can be seen from the table, the subsector approach has by far the best scores. The chance of success of such projects are therefore judged to be exceptionally favourable insofar as infrastructural constraints set no limits. Special attention must therefore be devoted to these areas. They can be overcome if infrastructural projects are coupled with subsector projects.

In this comparison, the functional project approach comes off worst. Only in its capacity for integration into existing administrative structures does it score a value of 1. As we will

CHANCES FOR SUCCESS OF VARIOUS PROJECT APPROACHES

(1: Good, 2: Moderate, 3: Poor)

Feature Determining Success	Subsectoral	Functional	Regional
1. Simplicity and clarity of objectives	1	2	2
2. Availability of Economically attractive technologies	1	2	2
3. Integration of basic production services	1	3	1
4. Access to experts and training of personnel	1	2	2
5. Ability of overcome infrastructural constraints	3	3	1
6. Integration into existing administrative structures	2	1	3

observe more closely, this is a very dubious advantage. Besides the inability to overcome infrastructural constraints, a major weakness of this type of project is its inability to integrate basic production services. Therefore, the functional project approach, can hardly be recommended to most developing countries at their present stage of development.

The regional project approach is strongest where the subsector approach is weakest, i.e,, in the ability to overcome infrastructural constraints. Where such constraints are a significant impediment to development, the regional project may be preferred. However, the unsuitability of the regional project for integration into existing administrative structures is a problem to be considered. This may not be so important in the main development phase when special measures above and beyond normal administrative routines are essential. But if administration breaks down upon the conclusion of this phase and if development experts are withdrawn sustained project success is endangered.

An objection may be raised that this comparison uses only economic-technical success as a measure, and that social aspects have been neglected. This is certainly true, but to address this matter, it would be necessary to include service sectors, especially education and public health, in all three possible project approaches. We must here limit

ourselves to the observation that economic and technical success is the groundwork for social progress. A hospital whose operating costs cannot be met because of inadequate income levels of the population is a dubious social achievement.

None of the project approaches examined above is ideal in meeting the aims and needs of developing countries. Therefore, in many of these countries, the three project types are found operating parallel to each other and in isolation. This has led to many jurisdiction difficulties and, in extreme cases to chaotic conditions in rural administration. within the functionally organized departments of a ministry of agriculture, semi-autonomous organizations have been created which may be subsector, function or region-oriented. If these structures are dissolved and restructured, then in restructuring, the subsector organisation should take precedence over regional. Generally, the regional projects serve as experimental fields for new technologies. But the main objection may be that the various sub-sectoral organisations maintain identical services like credit, input distribution, etc. like the new organisational forms of rural development in areas representing typical socio-economic problems.

The following conclusions can be drawn from the above analysis.

1. Of the alternative approaches to the design of agricultural development projects, the subsector approach is to be preferred. Its only weakness lies in the inability to overcome infrastructural constraints through its own resources. Therefore, infrastructural projects should be coupled with subsector projects, or appropriate measures should be built into the subsector project.

2. The regional project approach should be restricted to cases where infrastructural constraints cannot be overcome in any other way. In the early stages of development, this may often be true. Even so, the regional principle does not appear to be a sound basis for a strategy of rural development.

3. The functional project approach has so many weaknesses that it should be used only in exceptional cases, e.g. a research project, extension and credit projects. This approach may certainly be successful in more advanced stages of development, but is presently inappropriate for most developing countries.

4. Rural development administration in developing countries should be shifted from a functional to a subsector-oriented organizational principles, this being the project approach that promises the most success. With the creation of sub-sector oriented development organizations, a beginning has already been made in most countries.

PROJECT FINANCE - BUDGETARY IMPLICATIONS

SHRI K.S. SASTRY & SMT. RENUKA VISHWANATHAN[1]

External aid is taken into account for determining the total resources in the country's Plan. In addition to normal Central assistance for State Plans given under the Gadgil Formula, support is also given for specific development projects assisted by external financial agencies.

2. Prior to 1974, additionality of Central assistance for externally aided projects was allowed with regard to some important projects in State Plans aided by the World Bank on an ad hoc basis. Thereafter it was agreed that 15% to 25% of external aid received from the World Bank may be passed on to States for Plan projects. This was formalised in the meeting of the National Development Council in September, 1976. The assistance was an inducement for States to identify projects amenable to financing by external agencies, enhance their willingness to cooperate in project preparation and implementation and ensure that sufficient funds would be available for carrying out projects in a timely fashion. The incentive was increased in 78-79 when Central assistance for externally aided projects was stepped up to 70% of the aid disbursed.

3. Like other Central assistance, this is also passed on to States on loan-grant basis (70:30 or 10:90 depending on whether the State is a special-category State or not). The rate of interest for the loan is 8.75% with 15 years of repayment.

4. The terms and conditions of external assistance to the Centre vary depending on the source. In the case of IDA, the credit is repayable in 50 years with a grace period of 10 years. No interest is charged but payment has to be made for service changes on disbursed balance (0.75%) and commitment charges on the amounts not withdrawn from time to time (0.50%). In the case of IBRD, the loans are repayable in 20 years with a grace period of 5 years. Interest rates are revised biannually on the first of January and July. The present rate of interest in 7.92%. A commitment charge of 0.75% is also to be paid on the amounts not withdrawn from time to time. The overall external aid authorisations and utilisations in the country from time to time and from 1980 onwards classified by sources are indicated in the enclosed Annexure I to III.

5. The difficulties generally experienced while making budget provisions and transferring resources under external aid are as follows:-

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1. Shri K.S. Shastry is Additional Secretary, Ministry of Finance, GOI. Smt. Renuka Viswanathan is the officer in the Ministry of Finance, GOI.

i) For the Plan period the Central Government identifies resources including external resources. However, external aid is always project - tied. This means that a sufficient number of projects should be lined up for external assistance. The implementing agencies, including the States, may not have sufficient leeway in their Plans to take up fresh projects of the magnitude required by the Central Government. However, keeping in mind the need of the hour, commitments are made which are not realistic. As a result it is not possible to translate them into the required budgetary provisions over the 5 years of the Plan period resulting in under-drawal of external aid and inadequate progress in externally aided projects. There is no solution of a permanent nature to this since external agencies will not provide aid for budget support irrespective of the solvency of the Government.

ii) State Government demand that external aid should be passed on to them on the same terms as it is received by the Centre. Uniformity in terms and conditions is, however, preferable because States should not be subject to fluctuations in terms and conditions which would create accounting difficulties and uncertainty in estimating the overall financial burden. The overall mix of external assistance may carry a higher interest burden and this is particularly relevant with the declining IDA share. It would not be possible also to equitably distribute the repayment burden among the States since different credits and loans have different terms of interest and repayment. States should not also be subject to fluctuations in foreign exchange rates.

iii) States demand that the entire Central assistance should be transferred to them. This has not been agreed to since there is already a well-defined arrangement for transfer of resources on the non-plan side through Finance Commissions and on the plan aids through the Gadgil Formula approved by the National Development Council. Besides, project formulation depends on available natural resources, state finance and management capability, and the present system prevents regional imbalances and inequitable utilisation of external aid. The Centre is also investing resources in the form of manpower and funds for project negotiations and it also bears foreign exchange risk for the entire period of repayment. Direct transfer of external aid is not politically acceptable in a federal system as it would reduce the role of the Centre and establish bilateral relationships between States and lending agencies.

iv) A common complaint heard from States is that they have to make budget provisions to the full extent of the project but receive only 70% of the portion of the project (which is 50 to 60% in the case of IBRD) that is funded by the external agency and this is in the form of loan-cum-grant. State Governments indulging negotiation with the Planning Commission regarding Central assistance, market borrowings etc. and do not often make full provisions for externally aided projects. Besides, even where sectoral allocations are made, the Planning Commission does not earmark

expenditure on externally aided projects within sectors. Low provision in the budget means under-utilisation of external aid. There is often up to two years of delay in implementation, in such projects.

v) State Governments experience some delay in getting expenditure reimbursed from Government of India. The present procedure is for claims of total expenditure to be filed with the Controller of Aid Accounts in the prescribed form and after scrutiny the Controller claims reimbursement from the external agency to the extent eligible and, after receipt of the reimbursement, recommends release of Central assistance through the Department of Economic Affairs to the Department of Expenditure (Plan Finance Division). Since the Controller sends information to Finance Ministry every quarter, there is an average of four months delay between furnishing of the expenditure statement and reimbursement of expenditure to the State. There was considerable delay recently due to the difficulty in adopting the audit proforma prescribed by the World Bank and the proforma had to be modified for this reason.

vi) In the case of schemes in the agricultural sector, it is seen that the staff components, especially with regard to Training and Visit projects, is very high. This is in the very nature of such projects since their thrust is on extension. The World Bank itself recommends the kind of staff and qualifications as well as the number required in its Staff Appraisal Report. When the programme period is over, State Governments are left with a heavy recurring burden on this account which adds considerably to the budgeting problems.

6. An extract from a status report prepared by the Department of Agriculture & Cooperation (October, 1986) on World Bank assisted projects in agriculture may be seen at Annexure IV.

7. Tables 1 to 3 indicate the heads under which External Assistance flows into the Central Budget and flows out of it.

ANNEXURE - I

OVERALL EXTERNAL ASSISTANCE

(Rs.crores)

	Loans	Grants	Total (2+3)	PL480/665 etc.assistance Repayable in rupees	Repayable in convertible currency	Grand Total
1	2	3	4	5	6	7
A. AUTHORISATIONS:						
Upto the end of Fourth Plan	9665.3	753.1	10418.4	2307.1	330.4	13055.9
1974-75	1481.4	189.8	1671.2	..	..	1671.2
1975-76	2192.8	440.7	2633.5	..	20.0	2653.5
1976-77	806.7	386.1	1192.8	..	93.6	1286.4
1977-78	1536.6	337.6	1874.2	..	22.8	1897.0
1978-79	1894.6	441.1	2335.7	..	..	2335.7
1979-80	1295.1	564.4	1859.5	..	..	1859.5
1980-81	3771.2	75.7	3846.9	..	..	3846.9
1981-82	2633.0	207.4	2840.4	..	..	2840.4
1982-83	2525.5	423.3	2948.4	..	..	2948.8
1983-84	1692.2	386.9	2079.1	..	..	2079.1
1984-85	4221.3	470.7	4692.0	..	..	4692.0
1985-86	5085.5	313.4	5398.9	..	..	5398.0
Total	38801.2	4880.2	43791.4	2307.1	466.8	46565.3
B. UTILISATIONS:						
Upto the end of Fourth Plan . . .	8572.6	712.7	9285.3	2312.2	324.6	11922.1
1974-75	1220.4	93.9	1314.3	..	..	1314.3
1975-76	1464.9	283.3	1748.2	..	92.3	1840.5
1976-77	1285.3	245.8	1531.1	..	67.8	1598.9
1977-78	1007.5	260.6	1268.1	..	21.9	1290.0
1978-79	942.3	273.3	1215.6	..	..	1215.6
1979-80	1048.6	304.5	1353.1	..	..	1353.1
1980-81	1765.3	396.4	2164.7	..	..	2161,7
1981-82	1519.3	350.6	1869.9	..	..	1869.9
1982-83	1910.4	339.4	2249.8	..	..	2249.8
1983-84	1964.2	303.4	2267.6	..	..	2267.6
1984-85	1963.3	390.4	2353.7	..	..	2353.7
1985-86	2495.2	442.9	2938.1	..	..	2938.1
Total	27159.3	4397.2	31556.5	2312.2	506.6	34375.3

Notes: 1. Amounts of authorisation and utilisation in donor currencies have been converted into rupees at the pre-devaluation exchange rates upto the end of the Third Plan: at the post devaluation rates for the subsequent years upto 1970-71: at pre-May 1971 rates for 1971-72: at Central rates (which prevailed following the currency realignment of December 1971) for 1972-73. Figures of authorisation from 1973-74 onwards have been arrived at by applying the annual average exchange rate of the rupee with individual donor currencies. Figures of utilisation for 1973-74 have been arrived at by applying the quarterly average exchange rate of the rupee with individual donor currencies to the utilisation during the corresponding quarter: for 1974-75 at average exchange rate for the respective month, and for subsequent years at current rates applicable to the dates of transactions.

2. Loan amounts are net of surrenders, de-obligations and cancellations, etc. In case of PL-480, amounts are net of lapsed agreement.

3. Figures for utilisation are inclusive of suppliers' credits, and non-government loans upto 1977-78 which may not be fully reflected in authorisation figures. Subsequent data are exclusive of suppliers' credits, but inclusive of non-government loans.

4. Constituent items may not add up to totals because of rounding.

ANNEXURE -II

AUTHORISATIONS OF EXTERNAL ASSISTANCE CLASSIFIED BY SOURCE

(Rs.crores)

Source and type of assistance	1980-81	1981-82	1982-83@	1983-84@	1984-85@	1985-86@	1986-87 (April-(Sept.
1	2	3	4	5	6	7	8
I. Consortium Member							
(a) Loans . .	2614.9	2526.3	2471.7	1356.1	4221.3	3866.9	1826.7
(b) Grants. .	68.8	175.7	363.8	330.6	302.2	313.4	137.6
Total . .	2683.7	2702.0	2835.5	1686.7	4523.5	4180.3	1964.3
Country-wise Distribution							
(i) Austria							
(a)Grants. .	1.7	2.9	..	5.6	..	..	..
(b)Grants. .	..	..	..	..	..	..	..
Total . .	1.7	2.9	..	5.6	..	..	..
(ii) Bekguyn							
(a)Loans . .	..	10.5	7.4	6.9	..	..	..
(b)Grants .	..	..	..	..	..	..	..
Total . .	..	10.5	7.4	6.9	..	..	..
(iii) Canada							
(a) Loans .	65.8	108.5	..	37.0	196.8	2.7	..
(b) Grants .	4.9	..	..	..	1.8	..	..
Total .	70.7	108.5	..	37.0	198.6	2.7	..
(iv) Denmark							
(a) Loans .	..	18.3	17.7	22.0	26.6	..	..
(b) Grants .	..	..	..	3.8	..	..	..
Total .	..	18.3	17.7	25.8	26.6	..	..
(v) France							
(a) Loans .	182.0	126.4	243.3	..	32.8	143.7	86.9
(b) Grants .	..	..	..	..	..	..	..
Total .	182.0	126.4	243.3	..	32.8	143.7	86.9
(vi) Federal Republic of Germany							
(a) Loans .	215.2	56.0	203.5	81.1	188.3	153.5	97.6
(b) Grants .	..	..	..	2.8	..	..	..
Total .	215.2	56.0	203.5	83.9	183.3	153.5	97.6
(vii) Italy							
(a) Loans .	..	..	..	..	..	77.3	..
(b) Grants .	..	..	39.1	..	..	..	..
Total .	..	..	39.1	..	..	77.3	..
(viii) Japan							
(a) Loans .	46.6	294.5	83.3	..	451.2	223.6	..
(b) Grants .	15.0	15.9	15.8	8.6	16.1	16.1	..
Total .	61.6	310.4	99.1	8.6	467.3	239.7	..

(Rs.crores)

Source and type of assistance	1980-81	1981-82	1982-83@	1983-84@	1984-85@	1985-86@	1986-87@ (April-(Sept.)
1	2	3	4	5	6	7	8
(ix) Netherlands							
(a) Loans .	67.7	58.1	..	..	20.3	4.9	36.8
(b) Grants .	22.1	21.3	..	77.7	..	..	36.3
Total .	89.8	79.4	..	77.7	20.3	4.9	73.1
(x) Sweden							
(a) Loans .	..	..	..	..	..	..	..
(b) Grants .	..	72.7	..	45.6	..	106.4	..
Total .	..	72.7	..	45.6	..	106.4	..
(xi) U.K.							
(a) Loans .	..	..	..	..	..	..	..
(b) Grants .	..	64.3	285.9	152.7	260.3	171.4	63.0
Total .	..	64.3	285.9	152.7	260.3	171.4	63.0
(xii) U.S.A. .							
(a) Loans .	135.0	11.7	67.4	77.0	93.9	47.0	57.5
(b) Grants .	26.8	1.5	23.0	39.4	24.0	19.5	38.3
Total .	161.8	13.2	90.4	116.4	117.9	66.5	95.9
(xiii) I.B.R.D.	362.2	532.8	1087.0	520.6	2058.8	2122.2	1289.4
xiv) I.D.A. .	1538.7	1306.6	762.1	605.9	1152.6	1092.0	258.4
II. U.S.R.R. and East European Countries							
Loans . .	485.7	..	..	144.6	..	1134.0	..
Country-wise Distribution							
U.S.S.R.							
Loan . .	485.7	..	..	144.6	..	1134.0	..
III. Others							
(a) Loans. .	470.6	106.7	53.8	191.5	..	84.6	..
(b) Grants .	7.0	31.7	59.5	56.3	168.5	..	51.2
Total .	667.6	138.4	113.3	247.8	168.5	84.6	51.2
Country-wise Distribution							
(i) Switzerland							
(a) Loan .	..	..	..	48.6	..	..	..
(b) Grants .	..	..	12.5	14.6	..	..	..
Total .	..	..	12.5	63.2	..	..	..
(ii) European Economic Community/United Nations Emergency Operations							
(a) Loans .	..	..	..	..	..	..	..
(b) Grants .	..	26.7	47.0	41.7	168.5	..	51.2
Total .	..	26.7	47.0	41.7	168.5	..	51.2
(iii) O.P.E.C.Fund Loans	39.8	..	29.3	23.4	..	..	..

(Rs.crores)

Source and type of assistance	1980-81	1981-82	1982-83@	1983-84@	1984-85@	1985-86@	1986-87 (April- (Sept.
1	2	3	4	5	6	7	8
(iv) Saudi Arab Fund for Development							
Loans .	..	29.2	..	30.7*	..	51.6	..
(v) Kuwait Funds for Arab Economic Development							
(a) Loans .	..	77.5	..	52.1	..	30.8	..
(b) Grants .	7.0	5.0	..	..	..	..	..
Total .	7.0	82.5	..	52.1	..	30.8	..
(vi) International Fund for Agricultural Development							
Loans .	13.9	..	24.5	36.7	..	..	..
(vii) Iraq							
Loans .	82.9	..	..	..	..	..	..
(viii) IMF Trust Fund							
Loans .	534.0	..	..	..	..	..	..
(ix) International Sugar Organisation							
Loans .	..	..	..	..	..	2.2	..
GRAND TOTAL .	3846.9	2840.4	2948.8	2079.1	4692.0	5398.9	2015.5
(a) Loans .	3771.2	2633.0	2525.5	1692.2	4221.3	5085.5	1826.7
(b) Grants .	75.7	207.4	423.3	386.9	470.7	313.4	188.8

NOTES: Constituent items may not add up to total because of rounding.

@ Government account only.

* Saudi Riyal converted at end-September 1983 exchange rates.

ANNEXURE -III

AUTHORISATIONS OF EXTERNAL ASSISTANCE CLASSIFIED BY SOURCE

(Rs.crores)

Source and type of assistance	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87@ (April-(Sept.)
1	2	3	4	5	6	7	8
I. Consortium Member							
(a) Loans . .	1687.1	1471.4	1793.9	1860.8	1765.0	2270.2	3119.8
(b) Grants. .	311.8	265.2	228.2	201.1	301.8	281.6	272.8
Total . .	1998.9	1736.6	2022.1	2061.9	2073.8	2551.8	3392.6
Country-wise Distribution							
(i) Austria							
(a)Grants. .	2.0	4.0	2.8	2.2	2.3	3.6	2.1
(b)Grants. .	0.6	..	..	..	..	..	..
Total . .	2.6	4.0	2.8	2.2	2.3	3.6	2.1
(ii) Bekguyn							
(a)Loans . .	5.5	7.1	4.4	6.0	6.1	3.0	5.0
(b)Grants .	..	..	..	..	..	..	..
Total . .	5.5	7.1	4.4	6.0	6.1	3.1	5.0
(iii) Canada							
(a) Loans .	21.3	26.6	31.4	30.7	48.9	40.2	53.0
(b) Grants .	..	..	..	..	..	..	0.4
Total .	21.3	26.6	31.4	30.7	48.9	40.2	53.4
(iv) Denmark							
(a) Loans .	2.9	6.8	21.6	11.5	17.4	10.8	11.8
(b) Grants .	..	..	..	8.3	14.9	10.8	13.3
Total .	2.9	6.8	21.6	19.8	32.3	20.9	25.1
(v) France							
(a) Loans .	70.1	37.3	39.6	49.4	102.7	170.0	180.4
(b) Grants .	..	..	..	..	..	..	..
Total .	70.1	37.3	39.6	49.4	102.7	170.0	180.4
(vi) Federal Republic of Germany							
(a) Loans .	142.3	126.6	135.4	115.0	125.6	145.4	202.5
(b) Grants .	1.2	0.7	1.8	0.3	1.3	1.5	..
Total .	143.5	127.3	137.2	115.3	126.9	146.9	202.5
(vii)Italy							
(a) Loans .	..	..	..	..	8.7	11.9	45.4
(b) Grants .	..	..	..	..	..	..	..
Total .	..	..	39.1	..	8.7	11.9	45.4
(viii) Japan							
(a) Loans .	62.0	25.8	111.9	129.3	52.4	157.8	244.0
(b) Grants .	28.2	9.9	16.3	10.1	15.8	17.3	7.4
Total .	90.2	35.7	128.2	139.4	68.2	175.1	251.4

(Rs.crores)

Source and type of assistance	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87 (April-(Sept.
1	2	3	4	5	6	7	8
(ix) Netherlands							
(a) Loans .	72.5	85.6	32.0	38.9	16.6	45.8	50.0
(b) Grants .	33.8	18.0	17.6	31.8	51.4	34.7	17.8
Total .	106.3	103.6	49.6	70.7	68.0	80.5	67.8
(x) Sweden							
(a) Loans .	..	..	..	..	..	..	..
(b) Grants .	52.9	33.6	32.3	27.0	27.1	12.8	33.2
Total .	52.9	33.6	32.3	27.0	27.1	12.8	33.2
(xi) U.K.							
(a) Loans .	1.5	..	..	..	..	..	..
(b) Grants .	195.2	202.8	159.9	121.6	187.5	194.8	176.0
Total .	196.7	202.8	159.9	121.6	187.5	194.8	176.0
(xii) U.S.A. .							
(a) Loans .	82.4	69.6	29.2	74.1	41.8	59.9	80.0
(b) Grants .	..	0.1	0.3	2.0	10.8	10.4	24.7
Total .	82.4	69.7	29.5	76.1	52.6	70.3	104.7
(xiii) I.B.R.D.	138.8	376.9	286.5	485.7	344.0	394.6	799.1
xiv) I.D.A. .	522.0	692.9	1085.1	899.7	979.9	1198.0*	1417.1
(xv) EEC (Special Action Credit)	19.0	..	..	..	..	..	..
(xvi) IFAD .	7.3	12.3	14.0	18.3	18.6	29.2	29.4
(xvii) IMF Trust Fund .	537.5	..	..	..	..	..	..
II. U.S.R.R. and East European Countries Loans . .	32.9	22.6	40.0	74.7	108.0	161.2	175.0
Country-wise Distribution U.S.S.R. Loan . .	32.9	22.6	40.0	74.7	108.0	161.2	175.0
III. Others							
(a) Loans. .	45.3	25:3	76.5	28.7	90.3	63.8	149.7
(b) Grants .	84.6	85.4	111.2	102.3	81.6	161.3	123.6
Total .	129.9	110.7	187.7	131.0	171.9	225.1	273.3
Country-wise Distribution							
(i) Abu Dhabi Fund Loans .	2.0	..	..	..	..	..	..
(ii)Switzerland							
(a) Loan .	0.3	..	..	..	..	3.4	29.7
(b) Grants .	13.9	6.5	9.9	21.4	11.3	12.8	1.1
Total .	14.2	6.5	9.9	21.4	11.3	16.2	30.8

(Rs.crores)

Source and type of assistance	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87@ (April-(Sept.)
1	2	3	4	5	6	7	8
(iii) Other International Institutions@							
Grants .	..	..	..	21.6	21.0	41.9	37.0
(iv) European Economic Community/United Nations Emergency Operations							
Grants .	63.7	73.9	101.3	39.3	49.3	106.6	85.5
(b) Grants .	..	26.7	47.0	41.7	168.5	..	51.2
Total .	..	26.7	47.0	41.7	168.5	..	51.2
(v) Oil Producing Exporting Countries							
Loans .	3.4	9.2	37.4	6.5	6.2	4.7	10.0
(vi) Saudi Arab Fund for Deve-lopment							
Loans .	13.0	6.0	12.4	2.4	3.0	0.2	10.0
(vii) Iraq							
Loans .	0.7	..	..	..	..	..	..
(viii) Iran							
Loans .	17.3	..	..	..	..	..	..
(ix) Kuwait Funds for Arab Economic Development							
Loans .	8.6	10.1	25.5	18.0	80.0	53.4	100.0
	7.0@	5.0@					
(x) International Sugar Organisation							
Loans .	..	..	1.2	1.8	1.1	2.1	..
GRAND TOTAL .	2161.7	1869.9	2249.8	2267.6	2353.7	2938.1	3840.9
(a) Loans .	1765.3	1519.3	1910.4	1964.2	1963.3	2495.2	3444.5
(b) Grants .	396.4	350.6	339.4	303.4	390.4	442.9	396.4

Notes: 1. Constituent items may not add up to totals because of rounding.
2. Utilisation figures are exclusive of suppliers' credit and commercial borrowings.
@. Grants received from Kuwait for the construction of Indoor Stadium for Asiad Games 1982.
@@. Other International Institutions includes UNICEF, UNDP, ILO, WHO, UNFPA and UNESCO.
* Revolving Fund Receipt of Rs. 309.27 crores included against IDA credits.
** Estimated.

ANNEXURE-IV

World Bank and Indian Agriculture: 6. World Bank association with agriculture projects in India commenced with the approval of Agriculture Machinery Project which became effective in December 1949. The World Bank loan for this project was $ 10.0 million. Second agriculture project taken up and implemented with the World Bank assistance of $ 13.0 million was Tarai Seed Development Project which started in September 1969. During early 1970s, World Bank assistance for development of agriculture projects was mostly towards development of irrigation facilities through exploitation of ground-water resources. Subsequently, the assistance has been diversified to include other sectors and has been made available for development of seeds, dairy, fisheries, social forestry, horticulture, agricultural extension, construction of godowns, agricultural credit, watershed development, etc.

7. From three agriculture projects involving a total credit/loan of $ 75.5 million in 1970. Banks financial involvement is currently of the order of $ 1.37 billion.

8. Currently, there are 25 on-going Agricultural Projects in various stages of implementation with World Bank/IDA assistance. The Department of Agriculture & Cooperation is concerned with 16 of them. The following table shows the complete picture:-

	Ministry/Department responsible	No. of Project	Total assistance admissible ($ million)
1.	Department of Agriculture and Cooperation	16	866.3
2.	Department of Food	1	107.0
3.	Department of Agricultural Research and Education	2	99.0
4.	Department of Rural Development	1	14.0
5.	Department of Forests & Wild-life	5	285.8
	Total:	25	1372.1

9. The progress of disbursement of World Bank/IDA assistance for Agricultural Projects during the recent years is as under:-

($ million)

(April-March)

		1982-83	1983-84	1984-85	1985-86
1.	Projects concerning Department of Agricult-culture and Coopn.	256.6	285.0	112.9	135.2
2.	Projects concerning Department of Food, Deptt. of Agricultural Research & Education, Department of Rural Development and Deptt. of Forests & Wild-life	.35.5	30.4	53.3	51.4
	Total:	292.1	315.4	166.2	186.6

10. Agricultural projects assisted by the World Bank/IDA are distributed all over the country and cover various sub-sectors. National Projects such as National Dairy, ARDC-IV, Grain Storage and National Agricultural Research Project cover all the States and Union Territories.

I.F.A.D.

11. The International Fund for Agricultural Development (IFAD) came into operation in 1977. The objective of the Fund is to mobilise resources to be made available on concessional terms for agricultural development in developing member countries. The projects and programmes are specifically designed to introduce, expand or improve food production schemes and to strengthen related policies and institutions within the frame work of national priorities and strategies.

12. In keeping with these objectives, the focus of IFAD lending efforts has been on raising food production, reducing rural poverty and improving nutrition in developing countries. The member countries of IFAD are divided into 3 categories, namely, Category-I-OECD Group, Category-II OPEC Group and Category-III-other Developing countries. IFAD's financial resources are mobilised from Category-I and Category-II members who contribute them in convertible

currencies. Category-III countries make contributions in their own currencies whether freely convertible or not.

13. IFAD provides both loans and technical assistance grants to member countries although loans form the largest component. Three categories of loans are given: i) Loans at highly concessional rates with a maturity period of 50 years including a grace period of 10 years and carrying no interest but only a service charge of one per cent; ii) Loans on intermediate terms with a maturity period of 20 years including a grace period of 5 years and carrying interest of 4 per cent annually; and iii) Ordinary loans with interest of 8 per cent and a maturity period of 15-18 years including a grace period of 3 years. The lending terms and conditions are kept under periodic review by the Executive Board of the IFAD. IFAD normally provides assistance to cover about 50 per cent of the total project cost although in cases of co-financing with other agencies, the total assistance from both the sources may go upto 75 (even 90) per cent. Loans to countries which are not eligible for loans on highly concessional terms will be on intermediate or ordinary terms.

14. IFAD not only finance projects directly but also co-finances with other institutions like World Bank. Since its establishment till December 1985, total project loans sanctioned by IFAD amount to SDRs 1808.7 million (about $2039.2 million) for 177 projects in addition to SDRs 88.6 million (about $ 99.4 million) as technical assistance grants. About 67.3 per cent of the loans have been given on highly concessional terms.

15. India has been receiving assistance from IFAD. Four projects with a total assistance of $ 132.8 million are currently under implementation. Of the four projects, three projects are irrigation projects and are co-financed with World Bank. The remaining one agricultural project is the Sunderbans Development Project in West Bengal which has been directly financed by the IFAD and the assistance is of the order of $ 17.5 million.

TABLE 1 - BUDGET AT A GLANCE

(Rs. in crores)

	1986-87 Budget	1986-87 Revised	1987-88 Budget
Revenue Receipts	29944	33853	36688
Capital Receipts	19236	18190	20556
Total Receipts	49180	52043	57254
Plan Expenditure	20995	22932	23677
Non -Plan Expenditure	31888	37396	39265
Total Expenditure	52883	60328	62942
Overall Deficit	3703	8285	5688

TABLE 2 - CAPITAL RECEIPTS

(Rs. in crores)

	1986-87 Budget	1986-87 Revised	1987-88 Budget
Recoveries of Loans	3726	3634	4053
Market Borrowings	5300	5300	6300
External Assistance	2950	2436	3200
Small Savings	2100	2100	2200
@ includes external grants	434	501	512

TABLE 3 - PLAN EXPENDITURE

Budget Support for Central Plan	13617	14792	14923
Assistance of State & UT Plans	378	8140	8754
Normal Central Assistance for State Plans	5889	5831	6522
Other Central Assistance for State Plans	739	1432	1479
UT Plans	830	877	762

PROJECT PLANNING AND SCHEDULE DEVELOPMENT

S. SAROJA

INTRODUCTION

Successful agricultural project management must utilize the effective planning techniques. From a systems-related point of view, management must make effective utilization of all the resources. This effective utilization of resources over several different types of agricultural projects requires a systematic plan in which the whole organisation is considered as one large network subdivided into smaller ones.

The first step in total programme scheduling is understanding the project objectives and their relationship to overall objectives. The objective may be to develop a given area, or sector, improve an existing crop production/situation or simply increase employment opportunities.

The objectives are generally not independent; they are all interrelated both implicitly and explicitly. Many times it is not possible to satisfy all objectives. At this point, organisation must give priority to the objectives, deciding which are strategic and which are not.

Once the objectives are clearly defined, five questions must be considered:

1. What are the major elements of work required to satisfy the objectives and how are these elements interrelated?
2. Which functional/divisions will assume responsibility for accomplishment of these objectives and the major element work requirements?
3. Are the required organizational resources available?
4. What are the information flow requirements for the various projects?
5. At what point does senior management become involved?

If the project is large and complex, then careful planning and analysis must be accomplished by the various organizational units. The project organizational structure must be designed to fit the project; work plans and schedules must be established such that optimum allocation of resources can be made; resource costing and accounting systems must be developed, and a management information and reporting system must be established.

Effective total programme planning cannot be accomplished unless all the necessary information becomes available at the time of project initiation. These information requirements are:

* The Statement of Work (SOW)

* The Project Specifications

* The Work Breakdown Structure (WBS)

* The Milestone Schedule

The Statement of Work and the accompanying specifications must provide the necessary information so that all participants fully understand all of the work to be performed. The milestone schedule is a "rough" overall schedule showing the start date, end date, and the scheduled major milestones. Hopefully, the functional departments will be able to perform the required work within these key milestones.

WORK BREAKDOWN STRUCTURE

The successful accomplishment of objectives requires a plan which defines all of the effort to be expended and assigns responsibility to a specially identified organizational element. It should establish schedules and budgets for the accomplishment of the work. The preparation of this plan is the responsibility of the programme manager (Director, Deputy Director, Block Officer depending on the situation) and he will be assisted by the programme team assigned in accordance with programme requirements.

The first major step in the planning process is the development of the Work Breakdown Structure (WBS). The Work Breakdown Structure is the single most important element because it provides a common framework from which:

* The total programme can be described as a summation of subdivided elements.

* Planning can be performed.

* Costs and budgets can be established.

* Time, cost and performance can be tracked.

* Objectives can be linked to resources in a logical manner.

* Schedules and status reporting procedures can be established.

* Network construction and control planning can be initiated.

* The responsibility assignments for each element can be established.

The Work Breakdown Structure acts as a vehicle for breaking the work down into smaller elements, thus providing a greater probability that every major and minor activity will be accounted for. Although a variety of Work Breakdown Structures exist, the most common is the five-level structure shown below:

Level	Description
1	Total Programme
2	Project
3	Task
4	Subtask
5	Work Package

Level 1 is the total programme and is composed of a set of projects. The summation of the activities and costs associated with each project must equal the total program. On the other hand, each project can be broken down into tasks, where the summation of all tasks must equal to the summation of all projects which, in turn, must comprise the total program. The reason for this subdivision of effort is simple: projects are subdivided for control.Programme management therefore becomes synonymous with the integration of activities where the project manager acts as the integrator using the Work Breakdown Structure as the common framework.

The upper three levels of the WBS are normally specified by the head office as the summary levels for reporting purposes. The lower levels are generated by the operating offices for in-house control. Each level serves a vital purpose; level 1 is generally used for the authorization and release of all work; budgets are prepared at level 2, and schedules are prepared at level 3. Certain characteristics can now be generalized for these levels.

* The top three levels of the WBS reflect integrated efforts and should not be related to one specific project. Effort required by departments or sections should be defined in subtasks and work packages.

* The summation of all elements in one level must be the sum of all work in the next lower level.

* Each element of work should be assigned to one and only one level of effort. For example, the construction of the foundation should be included in one project (or task), not extended over two or three.

* The WBS must be accompanied by a description of the scope of effort required or else only those individuals who issue the WBS will

have a complete understanding of what work has to be accomplished. It is a common pitfall to reproduce the Statement of Work as the description for the WBS.

Table 1 shows a simple Work Breakdown Structure with the associated numbering system. The numbering system follows the Work Breakdown Structure; the first number represents the total programme (in this case, it is represented by 01); the second number represents the project; and the third number identifies the task. Therefore, number 01-03-00 represents project 3 of programme 01 while 01-03-02 represents task 2 of project 3. This type of numbering system is not unique; each programme may have its own system depending on how costs are to be controlled.

Work Breakdown Structure for Land Development

TABLE - 1

Programme	Land Development	01-00-00
Project 1 :	USAR Land	01-01-00
Task 1	Soil Amendments - Procurement	01-01-01
Task 2	Cost Effectiveness Analysis	01-01-02
Project 2	Drainage - 1	01-02-00
Task 1	Land Levelling	01-02-01
Task 2	Bunding	01-02-02
Project 3	Installation of Pumpsets	01-03-00
Task 1	Construction	01-03-01
Task 2	Installation	01-03-02
Task 3	Testing and Run	01-03-03
Project 4	Hilly Land Development	01-04-00
Task 1	Administration	01-04-01
Task 2	Purchasing Raw Materials (Supply of Seeds)	01-04-02

The preparation of Work Breakdown Structure is not easy. Since the WBS is a communications tool, it must provide detailed information to different levels of administration. If the WBS does not contain enough levels, then the integration of activities may prove difficult. If too many levels exist, it will lead to additional cost and paperwork. No attempt should be made to have the same number of levels for all projects, tasks etc. Each major work element should be considered by itself. The main objective of Work Breakdown Structure is to establish the number of required networks for cost control.

For many programs, the Work Breakdown Structure is established by the planner. If the administration is required to develop a WBS, then certain guidelines can be considered: A partial list is identified below:

* The complexity and technical requirements of the programme (i.e., the Statement of Work)
* The programme cost
* The time span of the program
* The internal structure for management control and reporting.
* The number of subcontracts if any.

Applying these guidelines serves only to identify the complexity of the program. This complexity of information must then be subdivided and released, (together with detailed information) to the different levels of the organization. The WBS should follow a specified criterion, because, although preparation of the WBS is performed by the programme office, the actual work is performed by the doers, not the planners.

Both the doers and the planners must be in agreement as to what is expected. A sample criteria listing for developing a Work Breakdown Structure is shown below:

* The WBS and work description should not be difficult to understand.
* All schedules should follow the WBS.
* No attempt should be made to arbitrarily subdivide work to the lowest possible level. The lowest level of work should not end up being a ridiculous cost in comparison to other efforts.
* Since scope of effort can change during a program, every effort should be made to maintain flexibility in the WBS.

From a cost control point of view, cost analysis down to the fifth level is advantangeous. However, it should be noted that the cost required to prepare cost analysis data to each lower level may increase exponentially, especially if the data is to be presented in a specified format which is not part of the usual standard operating procedures. The level-five work packages are normally for in-house control only.

The WBS can be subdivided into sub-objectives with finer divisions of effort as we go lower into the WBS. By defining sub-objectives we add greater understanding and, hopefully, clarity of action for those individuals who will be required to complete the objectives. Whenever work is structured, understood, easily identifiable and within the capabilities of the officers and farmers, then there will almost always exist a high degree of confidence that the objective can be reached.

Work Breakdown Structures can be used to structure work for reaching such objectives as lowering costs, training farmers, improving morale and lowering wastage. The lowest subdivision now becomes an end-item or sub-objective, not necessarily a work-package.

Each Work Package has discrete, scheduled start and completion points. The responsibility for the work to be accomplished is assigned to a single organizational unit. All Work Packages are uniquely identified so that all resources budgeted can be traced to one and only one organizational unit.

Work Packages are identified in money, time or other measurable units which have assigned values or budgets. They reflect the estimate of the total cost expected to be incurred for that unit of work. The sum of the Work Package budgets is published in both money and hours. Once a Work Package is initiated, the assigned budget and schedule must not be changed since they form the baseline against which actual work accomplishment and expenditure are compared for performance measurement purposes.

Each month after payment, the budgets for all work scheduled to have been completed, and the value for the work actually accomplished, are compared to determine schedule variance. A comparison of actual costs to date with the value planned for the work accomplished provides the office with a cost variance either an overrun or an under-run. Cost and schedule variances in farm labour and materials (seeds, fertiliser, construction) are tabulated for comparison purposes. By summarizing all data elements up through the Work Breakdown Structure, overall performance can be evaluated with respect to cost and schedule. Technical performance can also be assessed and related to cost and schedule. By summarizing through the organizational structure, performance of functional organizations can be evaluated.

One of the most important functions of the Work Breakdown Structure is to provide a disciplined framework from which actual network plans can be prepared. The definition provided by the Work Breakdown Structure builds this framework by providing a basic list of the networks required, a description of the items needed in each of the networks (needed to select the Work Packages), and a composite picture of the basic milestone and interface events. Milestones are specific events directly related to certain points in time against which cost or performance tracking will be accomplished. Typical milestones might be the completion of a finished product, the testing of a piece of equipment or the purchase of an item. Interface events are events which occur between milestones, usually requiring a change in responsibility. Typical interface events might require the approval of designs, authorization for procurement funds or provision of a facility.

Careful consideration must be given to the design and development of the Work Breakdown Structure. The Work Breakdown Structure, through Work Packages, provides the basis for: (See Figure 1)

* The responsibility matrix

* Network scheduling

* Costing

* Risk analysis

* Organizational structure

* Objective coordination

* Control (including contract administration)

Once the WBS is established and the programme is "kicked off," it becomes a very costly procedure to either add or delete activities, or change levels of reporting because of cost control. Many organisations do not give careful forethought to the importance of a properly developed WBS and ultimately risk cost control problems downstream. One important use of the WBS is that it serves as a cost control standard for any similar future activities. One common mistake made by the administration is to combine technical support activities with administrative activities. For example, a senior Scientist in the Agriculture Ministry may be required to provide technical support throughout the duration of the program. By spreading out the technical and administrative support over many projects, a false picture is obtained as to the time and effort needed to accomplish each project in the program. In fact, the administrative and technical support functions may be constant, regardless of the number of project and tasks.

1

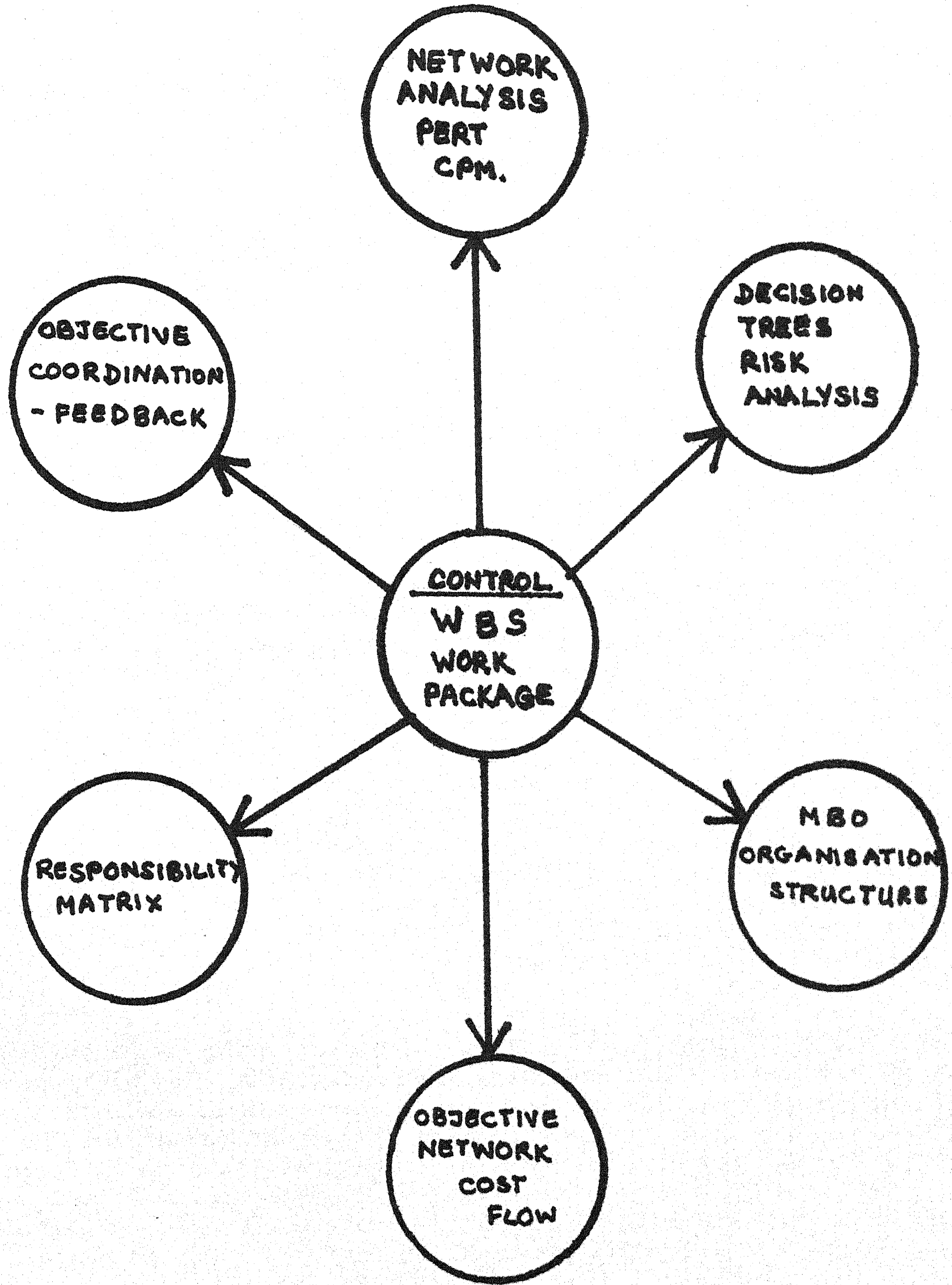


FIG - 1 WBS FOR OBJECTIVE CONTROL AND
AND EVALUATION. EVALUATION.

THE PLANNING CYCLE

No programme or project can be efficiently organized and manned without some form of a Management Cost and Control System (MCCS). Figure 2 shows the five phases of a Management Cost and control System. The first phase constitutes the planning cycle and the next four phases identify the operating cycle.

Figure 3 shows the activities included in the planning cycle. The Work Breakdown Structure serves as the initial control from which all planning emanates. The WBS acts as a vital artery for both communications and operations, not only for the planning cycle, but also for all other phases as well.

WORK PLANNING AUTHORIZATION

Some form of authorization is needed before work can begin, even in the planning stage. Both work authorization and work planning authorization are used to release funds, but for different purposes. Work planning authorization releases funds (primarily for functional management) so that scheduling, costs, budgets and all other types of plans can be prepared prior to the release of operational cycle funds.

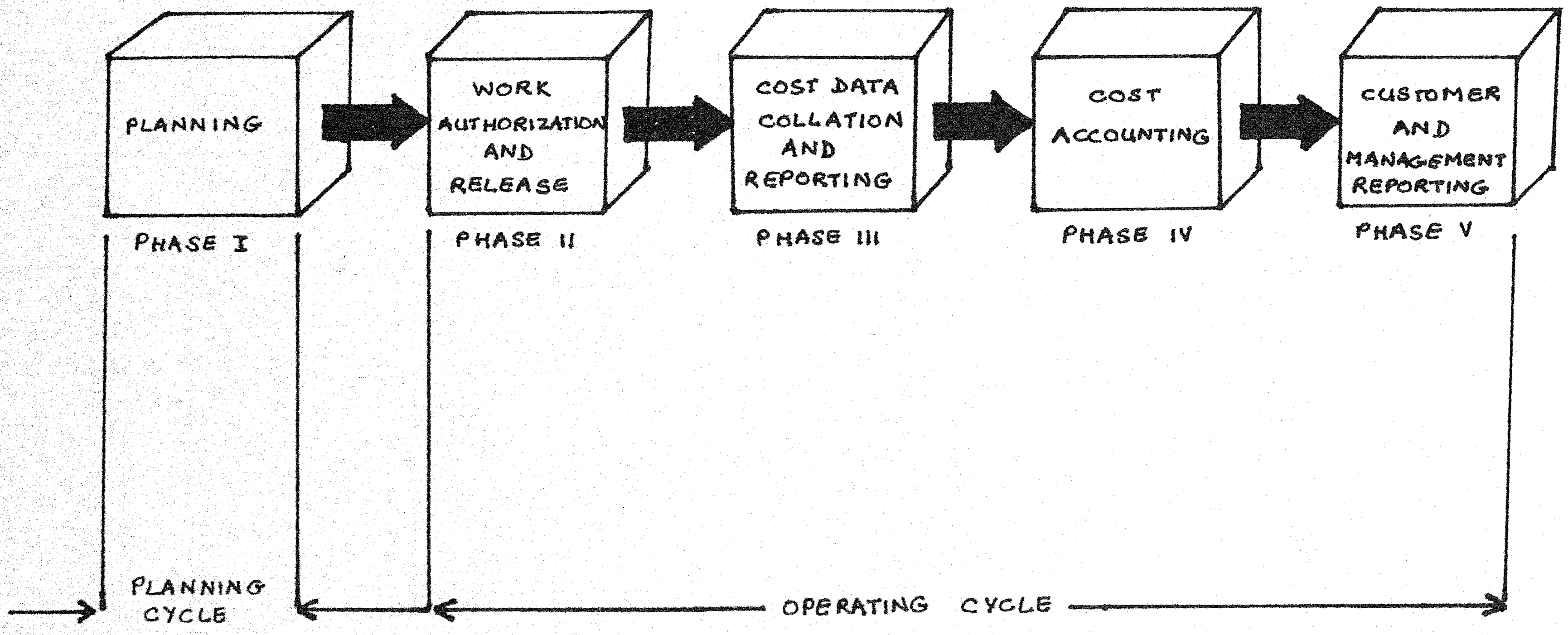
This work authorization is identified as a Subdivided Work Description (SWD), which is a narrative description of the effort to be performed by the cost center. This package establishes the work to be performed, the period of performance, and possibly the maximum time available. The SWD is multipurpose in that it can be used to release funds, authorize planning, describe activities as identified in the WBS and, last but not least, release work.

The SWD is one of the key elements in the planning of a programme as shown in Figure 3. The administration releases the funds by issuing a SWD which sets forth general contractual requirements and authorizes programme management to proceed.Programme management issues the SWD to set forth the contractual guidelines and requirements for the functional units. This specifies how the work will be performed, which functional organizations will be involved, who has what specific responsibilities and authorizes the utilization of resources within a given time period.

The SWD authorizes both the programme team and functional management to begin work. As shown in Figure 3 the SWD provides direct input to Phase II of the MCCS. Phase I and Phase II can and do operate simultaneously because it is generally impossible for programme office personnel to establish plans, procedures and schedules without input from the functional units.

2

FIGURE-2. PHASES OF A MANAGEMENT COST AND CONTROL SYSTEM.



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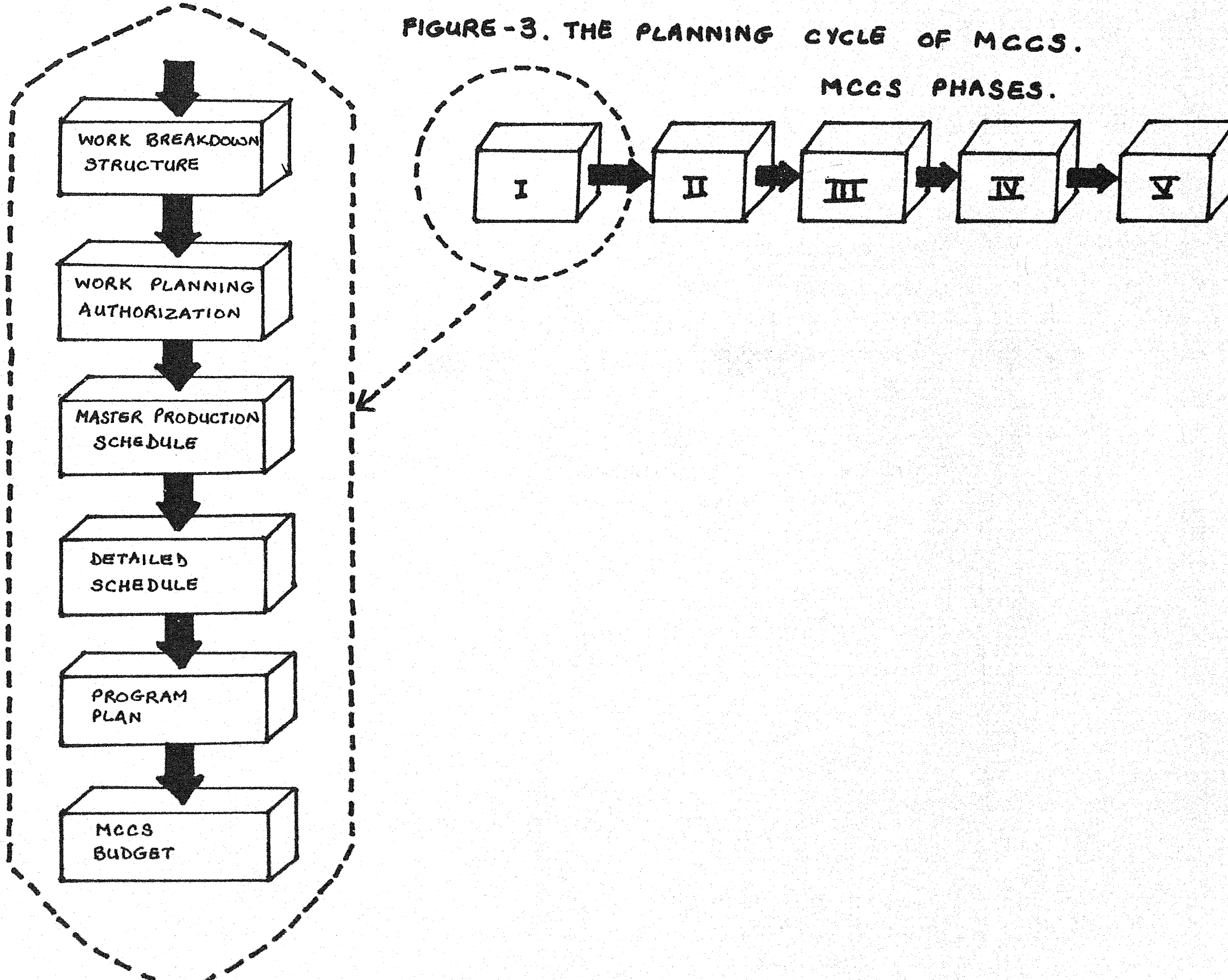

FIGURE-3. THE PLANNING CYCLE OF MCCS.

The SWD package is used by the operating organizations to further subdivide the effort defined by the WBS into small segments of Work Packages.[1]

LABOUR

The operating organizations, using the Subdivided Work Description and under the direction of the programme team leader, analyse the work required to measure the effort directly.

The Work Packages are then assigned a manhour value by using historical data, standards, or the best estimate of the person assigned to complete the Work Package. As a general rule, 50 percent of this value is assigned when work is begun and the remaining 50 percent is assigned at completion of the Work Package.

The MCCS Planning Charts, when approved by programme team members and programme managers, are used for the preparation of MCCS Direct Budget Time Plan, Estimates-at-completion reports (figure 4). The MCCS Direct Budget Time Plan Reports, once established, remain the same unless any revision is called for.

The Time Plan is normally a monthly statement of all planned effort by Work Package and organizational element over the life of the project and serves as the data bank for preparing the status, completion Reports.

Initially, the Estimate-at-Completion Report is identical to the Budget Report, but changes throughout the life of a programme to reflect deterioration or improvement in performance.

MATERIAL

Upon release of the Work Statement, Work Breakdown Structure, and Subdivided Work Description, the End-Item Bill of Material and Production Plans are prepared as shown in Figure 5. End-item materials are those items identified as an integral part of the project output. Support materials consist of those materials required by operations, to support the project work to achieve its output and are identified in the Production Plan.

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1. The assumption is made here that the original WBS contained only three levels, Otherwise, this step would not be necessary.

· FIGURE - 4 LABOR PLANNING FLOW CHART.

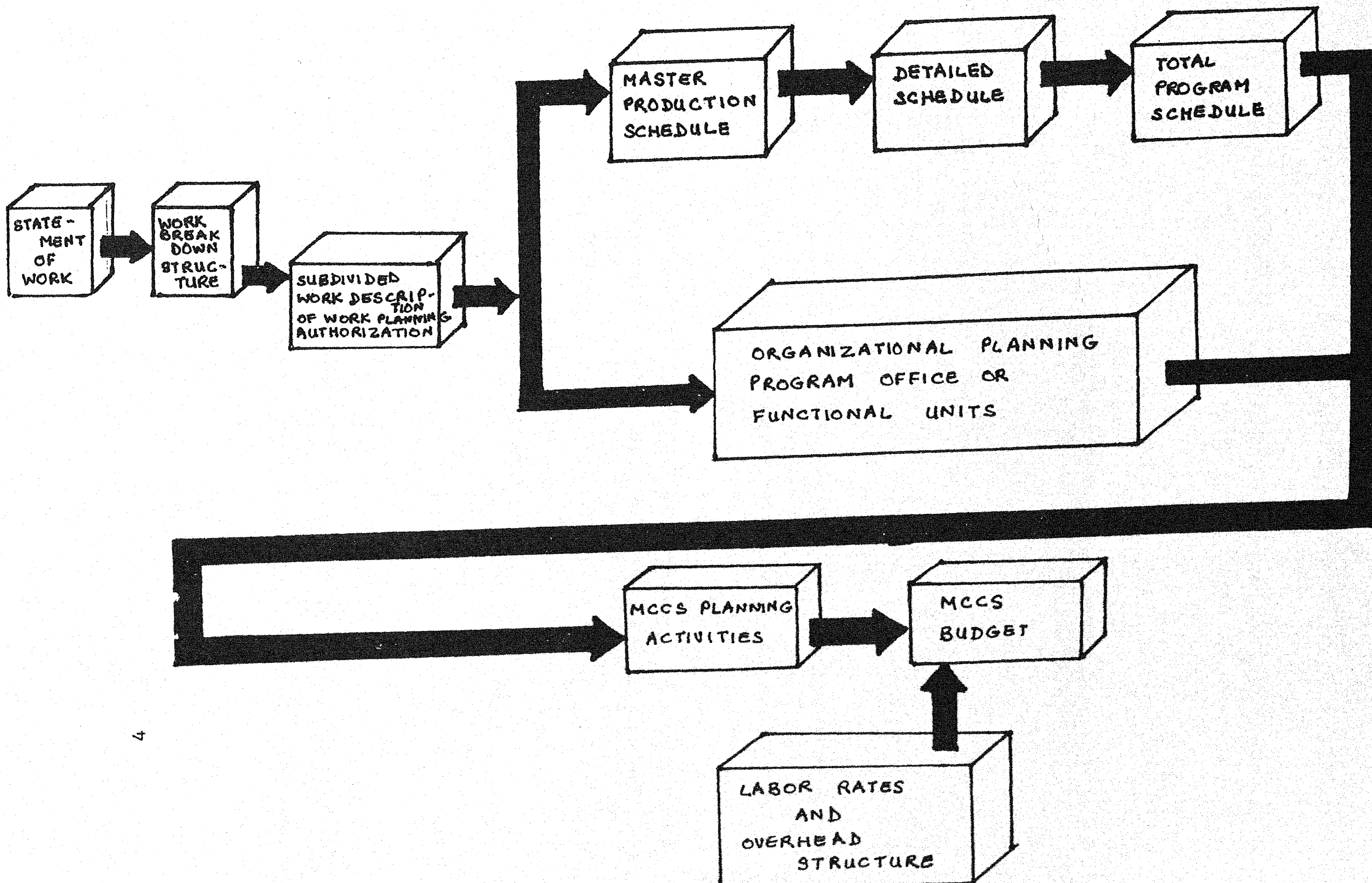

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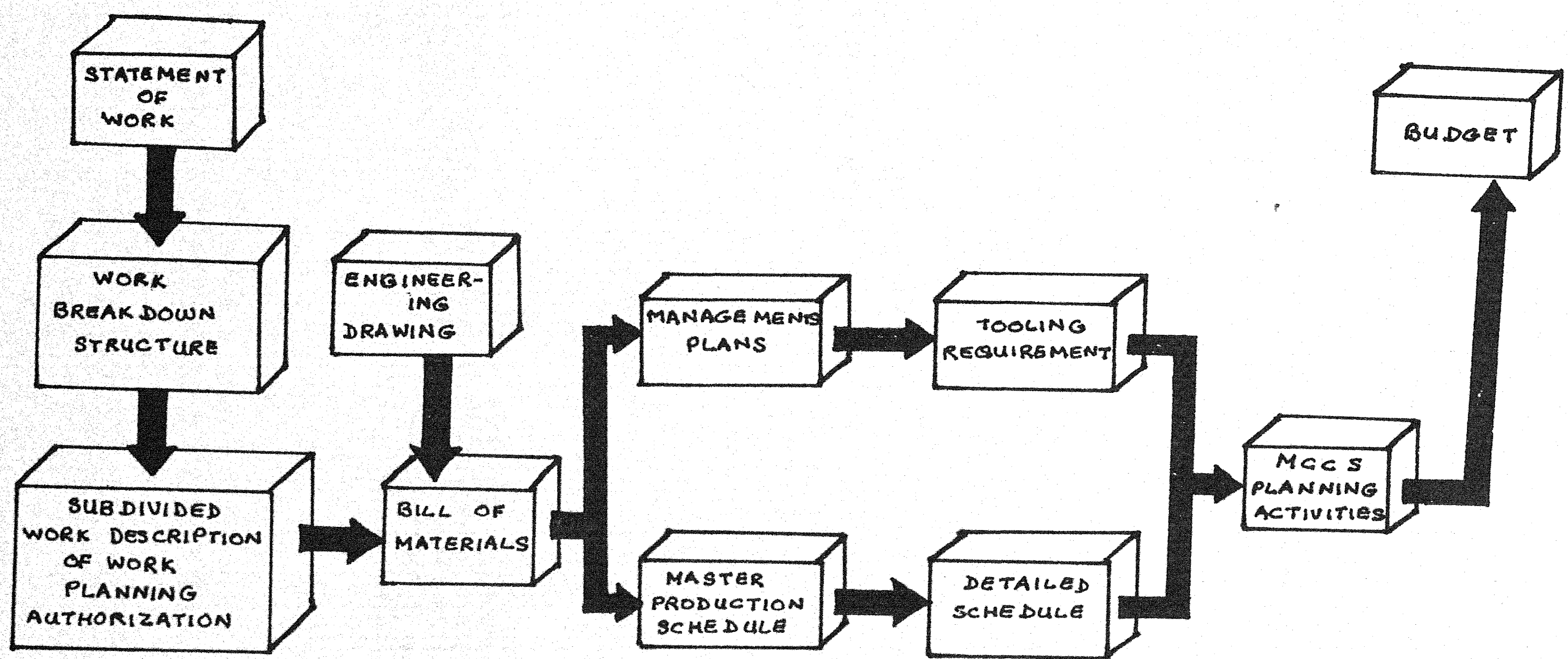
Fig. 5

FIGURE - 5. MATERIAL PLANNING FLOW CHART.



A Procurement Plan/Purchase Requisition is prepared as soon as possible and if necessary contracts are entered into. This plan is used to monitor material acquisitions, forecast inventory levels, and identify material price variances.

Production Plans, prepared upon release of the Subdivided Work Descriptions, are used to prepare input lists for production, and quality assurance. These items are priced by cost element for input on the MCSS Planning Charts.

FREIGHT AND TRANSPORT

Transport and freight can be planned on a statistical basis or on actual planned usage if data is available. The budget is planned for a particular level of the Work Breakdown Structure and organization element depending on where transport or freight is to be controlled.

OVERHEAD COST CONTROL

The prime factor in the control of overhead costs is the annual budget. The annual budget is the result of goals and objectives established by the organisation. The budget is reviewed and approved at all levels of management. It is established at department level and the department head has direct responsibility for identifying and controlling costs against the approved plan.

These departmental budgets are summarized, in detail, to higher levels of management. This summarization permits senior administrators, at these higher organizational levels to be aware of the authorized budget in their area of responsibility.

Reports are published monthly indicating current month and year-to-date budget, actual and variances. These reports are published for each level of management and an analysis is made by the head office. Each directorate is then reviewed with the finance person who is assigned the overhead cost responsibility.

CONTRACT CHANGES

The planning for contract changes is handled, when practical, by adding or deleting elements from the Work Breakdown Structure. However, when this is not practical, little changes are made to individual Work Packages. The old Work Package value is then deleted from the system and replaced by the new value. The planning chart for the contract change provides the documentation for auditing and a justification for the change.

RESERVE

The difference between the budget released to the operating organizations and the negotiated target cost, is termed as Reserve. This Reserve is computed for each project. The scheduling of reserve is a function of the finance team member but must be approved by the programme director[2]

MASTER PRODUCTION SCHEDULING

The release of the SWD, as shown in Figure 3, authorizes the implementing units to prepare a Master Production Schedule from which detailed analysis of the utilization of resources can be seen and tracked.

Master Production Scheduling is not a new concept. This system reviews order back-logs to develop a new plan over the next period. The production plan is then exployed manually to determine what materials must be purchased when. However, rapidly changing requirements and fluctuating lead times, combined with the slow response to these changes, can result in the disruption of Master Production Scheduling.

MASTER PRODUCTION SCHEDULE DEFINITION

A Master Production Schedule is a statement of what will be the crop pattern, how many hectares will be under a particular crop, and when it will be ready. It is a production plan, not a sales plan. The MPS considers the total demand for input resources, including fertilisers, pesticides, seeds, manure, labour and seedlings. The MPS must also consider the characteristics of the land and the constraints imposed by the technology, soil, climate and rainfall.

Provisions must be made in the overall plan for each type of crop. All planning for inputs, manpower, equipment and financing for both the seasons is done by the Master Production Schedule.

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2. The finance team member may also be responsible for all work authorization. In many offices, however, there exists an administrator/or project control in the programme office strictly to serve as the focal point for all work-authorization paper-work.

OBJECTIVES OF THE MPS

* To provide top management with a means to authorize and control manpower levels, inventory investment and expected cash flow.

* To coordinate marketing, cropping pattern, equipment and finance activities by a common performance objective.

* To reconcile demand, marketing and production needs.

* To provide an overall measure of performance.

* To provide data for material and capacity planning.

The developing of a Master Production Schedule is a very important step in a planning cycle. Master Production Schedules directly tie together personnel, materials, equipment and facilities. Master Production schedules should also identify those key dates for control purposes.

6. DETAILED SCHEDULES AND CHARTS

The scheduling of activities is the first major requirement of the programme officer after programme go-ahead. The programme office normally assumes full responsibility for activity scheduling provided that the activity is not too complex. For large programmes, functional management input is also required before scheduling can be completed. A member of the programme staff should constantly develop and update activity schedules so as to provide a means of tracking programme work. The resulting information is then provided to the programme office personnel, functional management and team members.

Activity scheduling is probably the single most important tool for determining how the resources should be integrated so that synergy will be produced. Activity schedules are invaluable for projecting time-phased resource requirements as well as providing a basis for visually tracking performance. Most programmes begin with the development of the schedules in order that accurate cost estimates can be made. The schedules serve as master plans from which we can have an up-to-date picture of operations.

Certain guidelines should be followed in the preparation of schedules.

* All major events and dates must be clearly identified. If a Statement of Work is supplied by the farmer (for building pumphouse) then those dates shown on the accompanying schedule must be included. If for any reason the client's/farmer's

milestone dates cannot be met, then the person should be notified immediately.

* The exact sequence of work should be defined through a network in which interrelationships between events can be identified.

* Schedules should be directly relatable to the Work Breakdown Structure. If the WBS is developed according to a specific sequence of work, then it becomes an easy task to identify work sequences in schedules using the same numbering system as in the WBS. The minimum requirement should be to show where each task starts and finishes, and when all tasks start and finish.

* All schedules must identify the time constraints and, if possible, should identify those resources required for each event.

Although these four guidelines serve as reference for schedule preparation, they do not define how complex the schedules should be. Before preparing the schedules, three questions should be considered:

* How many events or activities should each network have?

* How much of a detailed technical breakdown should be included?

* Who is the intended audience for this schedule?

Most organizations develop multiple schedules: summary schedules for administrators and planners, and detailed schedules for the doers and lower level control. The detailed schedules may be strictly for interdepartmental activities.Programme management must approve all schedules down through the first three levels of the Work Breakdown Structure.

The necessity for two schedules is clear. According to Martin[3], "In larger complicated projects, planning and status review by different echelons are facilitated by the use of detailed and summary networks. Higher levels of management can view the entire project and the interrelationships of major tasks without looking into the detail of the individual subtasks. Lower levels of management and supervision can examine their parts of the project in fine detail without being distracted by those parts of the project with which they have no interface".

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3. Charles Martin, Project Management: How to Make IT Work. (New York: Amacom, a division of American Management Association), 1976.p.137

One of the most difficult problems to identify in schedules is a hedge position. A hedge position is a situation in which the project office may not be able to meet a milestone date without incurring a risk, or may not be able to meet activity requirements following a milestone date because of contractual requirements. To illustrate a common hedge position, consider example below:

Example: Agro-Industries Corporation is currently working on a project which includes three phases: design, development and qualification of a certain agricultural implement/animal feed. Contractual requirement with the government specify that no product will be fabricated with the development phase until the design review meeting is held following the design phase. The Corporation has felt that if they do not begin component fabrication prior to the design review meeting, then the second and third phase will slip down. The corporation is willing to accept risk that should specifications not be acceptable during the design review meeting, then it will incur the costs associated with pre-authorization of fabrication. How should this be shown on a schedule? (The problems associated with performing unauthorized work are not being considered here.)

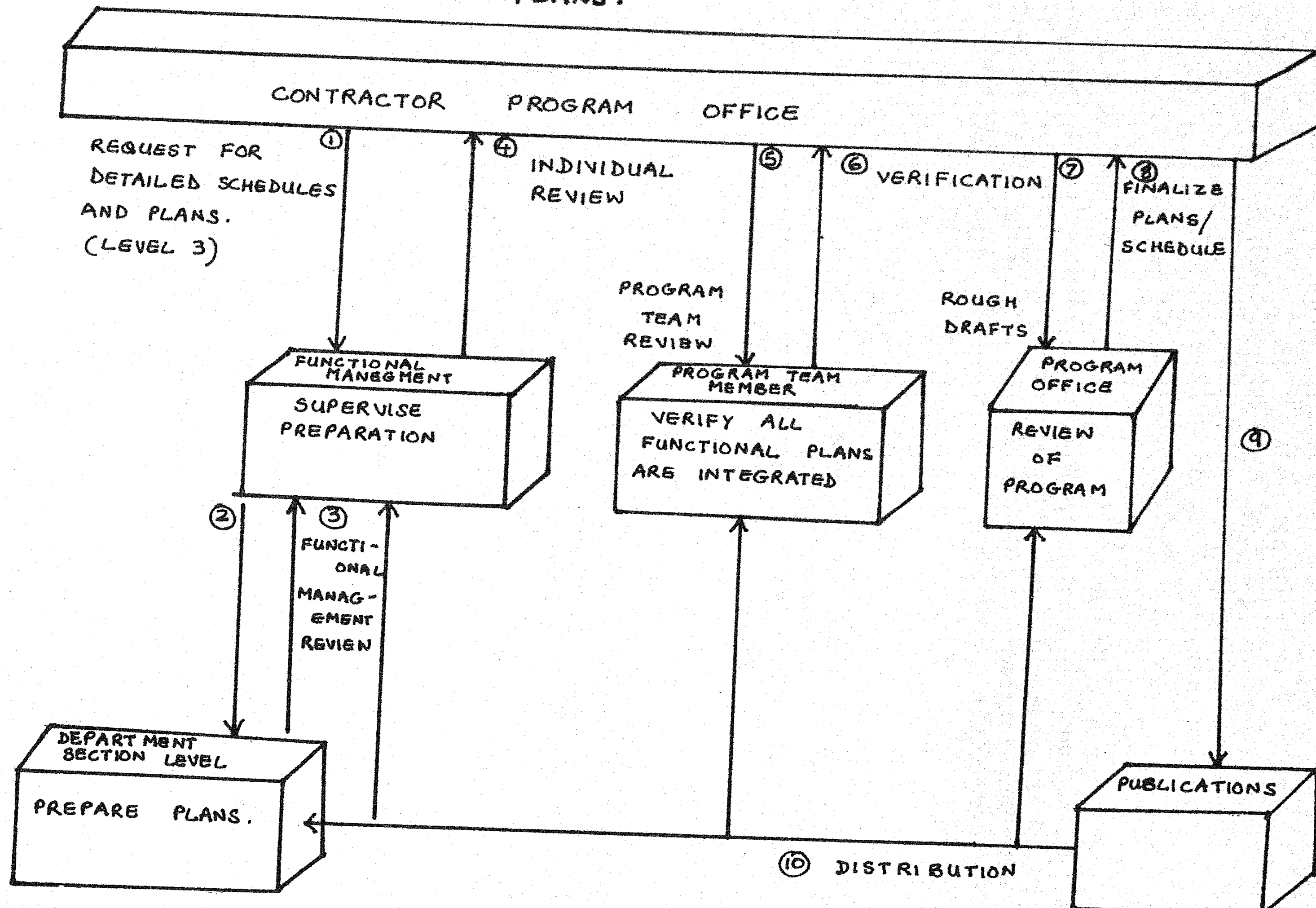
The solution to the example is not an easy one. The corporation must play an honest game and identify on the Master Production Schedule that component fabrication will begin early, at its own risk. This should be followed up by a contractual letter in which both the government and the public sector corporation understand the risks and implications.

This example also brings up the question as to whether this hedge position should have been eliminated with proper planning. Hedge positions are notorious for occurring in research and development or design phases of a program. The corporation's technical community, for example, may have anticipated that each component could be fabricated in one week based on certain raw materials. If new raw materials were required or a new fabrication process has to be developed, then it is possible that the new component fabrication time could increase from one week to two or three, thus creating an unanticipated hedge position.

Detailed schedules are prepared for almost every activity. It is the responsibility of the programme office to marry all of the detailed schedules into one master schedule to verify that all activities can be completed as planned. The preparation sequence for schedules (and also for programme plans) is shown in Figure 6. The project/programme office submits a request for detailed schedules to the functional managers. The request may be in the form of a planning work authorization document. The functional managers then prepare summary schedules, detailed schedules, and if time permits, interdepartmental schedules. Each functional manager then reviews his schedules with the programme office. The programme office, together with the functional programme team members, integrate all of the plans and schedules and verify that all dates can be met.

FIG 6

FIGURE-6. PRPORATION SEQUENCE FOR SCHEDULES AND PROGRAM PLANS.



Before submitting the schedules to publications, rough drafts of each schedule and plan should be reviewed. This procedure accomplishes the following:

* Verifies that nothing has fallen through the crack.
* Prevents immediate revisions to a published document and can prevent embarrassing moments.
* Minimizes costs by reducing the number of early revisions.
* Shows the farmers and other participants, early in the program, their roles help and inputs into the planning phase.

After the document is published, it should be distributed to all programme office personnel, functional team members functional managements and participants.

The exact method of preparing the schedules is usually up to the individual performing the activity. All schedules, however, must be approved by the programme office. If the schedules are prepared in such a manner as to be easily understood by all, then the schedules may be used both inhouse as well as for review meetings, in which case we can "kill two birds with one stone" by tracking cost and performance on the original schedules.

In addition to the detailed schedules, the programme office, with input provided by functional management, must develop organizational charts. The organizational charts provide information to all active participants of the project as to who has responsibility for each activity. The organizational charts should display the formal (and often informal) lines of communication.

The programme office may also establish Linear Responsibility Charts (LRCs). Regardless of the best attempts by administrator, many functions in an organization can overlap between more than one functional unit. Also, management might wish to have the responsibility for a certain activity given to a functional unit which normally would not have this responsibility. This is a common occurrence on short-duration programs where management desires to cut costs and red tape.

7. PROGRAMME PLAN

Fundamental to the success for any project is documented planning in the form of a programme plan. In an ideal situation, the programme office can present the functional manager with a copy of the programme plan and simply say, "execute it".

For large and often complex programs, the main organisation may require a programme plan which documents all activities within the program. The programme plan then serves as a guideline for the lifetime of the programme and may be revised as often as once a month, depending upon the circumstances and the type of program. (i.e. research and development programme require more revisions to the programme plan than manufacturing or construction programs.) The programme plan provides the following framework:

* Eliminates conflicts between functional managers.

* Provides a standard communicative tool throughout the lifetime of the programme (programme plan should be geared to the Work Breakdown Structure).

* Eliminates conflict between functional management and programme management.

* Provides verification that the implementor understands the administrator's objectives and requirements.

* Provides a means for identifying inconsistencies in the planning phase.

* Provides a means for early identification of problem areas and risks so that no "surprises occur downstream".

* Contains all of the schedules as a basis for progress analysis and reporting.

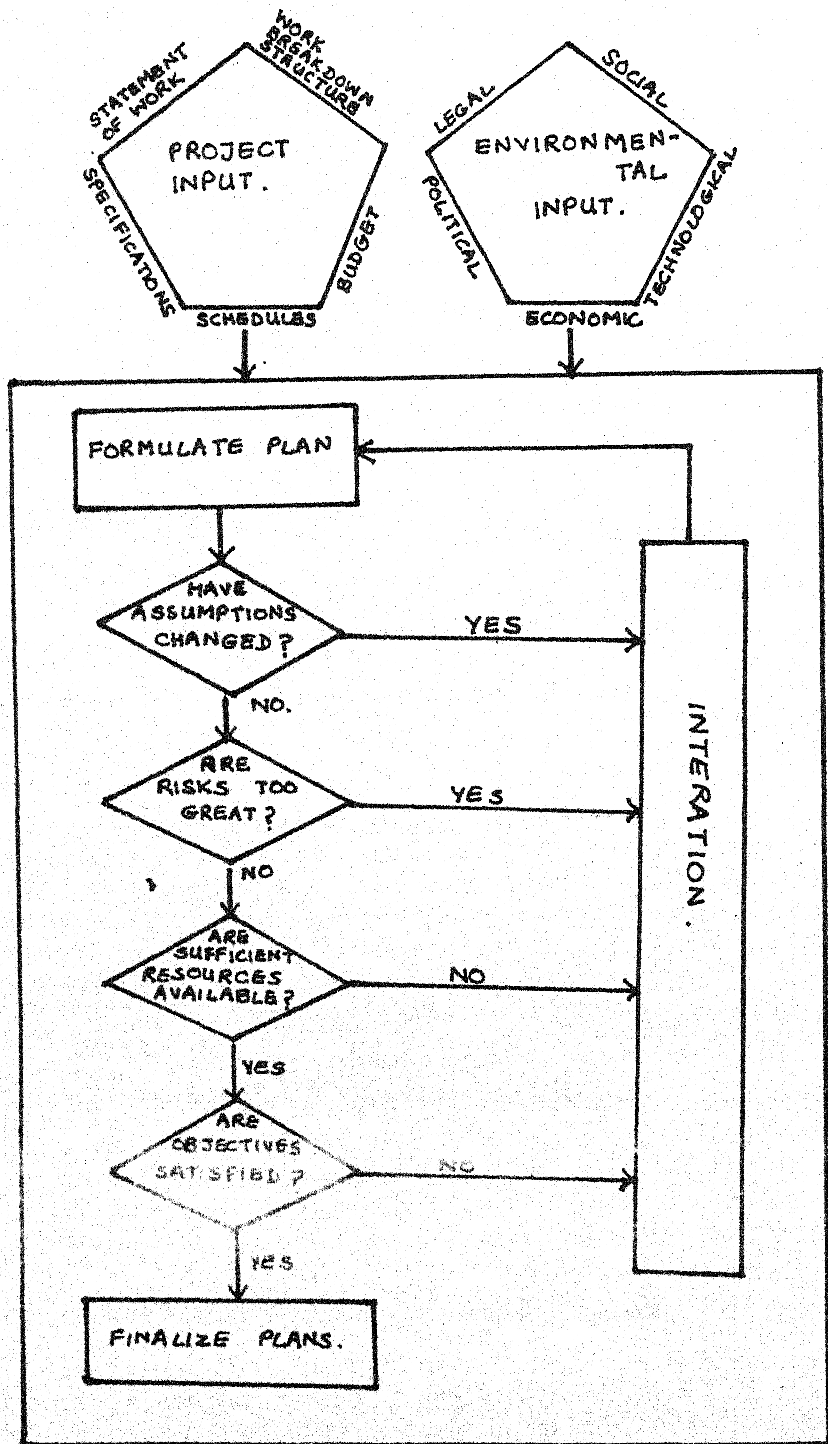
Development of a programme plan can be time-consuming and costly. The input requirements of the programme plan depend on the size of the project and the integration of resources and activities. All levels of the organization participate. The senior levels provide summary information and the lower levels provide the details. The programme plan as with activity schedules, does not preclude departments from developing their own planning.

The programme plan must identify how the resources will be integrated. Finalization of the programme is an iterative process similar to the sequence of events for schedule preparation as shown in Figure 6. Since the programme plan must include the necessary explanation to the events in Figure 6, additional iterations are required (Figure 7). Small iterations can compel major changes in a program.

The programme plan is a standard from which performance can be measured, not only by the head office, but by programme and functional management as well. The plan serves as a cookbook for the duration of the programme by defining for all personnel identified with the program:

FIG 7

FIGURE -7. FLOW CHART FOR THE PLANNING PROCESS.



* What will be accomplished.

* How it will be accomplished.

* Where it will be accomplished.

* When it will be accomplished.

* Why it will be accomplished.

These definitions force everybody to take a hard look at:

* Programme Requirements

* Programme Management

* Programme Schedules

* Facility requirements

* Logistic Support

* Financial Support

* Manpower and Organization

The programme plan is more than just a set of instructions. It is an attempt to eliminate crisis by preventing anything from "falling through the crack." The plan is documented and approved by both the main office and the project office to determine what data, if any, is missing, and the probably resulting effort. As the programme matures, the programme plan is revised to account for new or missing data. The most common reasons for revising a plan are:

* "Crashing" activities to meet end dates

* Trade off decisions involving manpower, scheduling and performance.

* Adjusting and levelling manpower requests.

Maturity of a programme usually implies that crisis will decrease. Unfortunately, this is not always the case.

The make-up of the programme plan may vary from organisation to organisation. Most programme plans can be subdivided into four main sections: introduction, summary and conclusions, management, and technical. The complexity of the information is usually left to the project office provided that main organization's requirements, as may be specified in the Statement of Work are satisfied.

The introductory section contains the definition of the programme and the major parts involved. If the programme is a follow-on to another program, or an outgrowth of similar activities, this is also identified together with a brief summary of the background and history behind the project.

The summary and conclusion section identifies the targets and objectives of the programme and includes the necessary "lip service" as to how successful the programme will be and how all problems can be overcome.This section must also include the Programme Master Schedule showing how all projects and activities are tied together. The total programme Master Schedule should include the following:

* An appropriate scheduling system (Bar Charts, Milestone Charts, Network, etc.).
* A listing of activities at the project level or lower.
* The possible interrelationships between activities. (This can be accomplished by logic networks, critical path or PERT networks.)
* Activity time estimates. (This is a natural fallout from the item above.)

The summary and conclusion chapter is usually the second section in the programme plan so that upper-level administration can have a complete overview of the programme without having to search through the technical information.

The management section for the programme plan contains procedures, charts and schedules for the following:

* The assignment of key personnel to the program. This usually calls out only the project office personnel and team members, since under normal operations they will be the only individuals interfacing with the main organisation.
* Manpower, planning and training will also be discussed so as to ensure the availability of qualified personnel.
* A linear responsibility chart might also be included to identify the authority relationships which will exist in the project office.

The technical section may include as much as 75 to 90 percent of the programme plan. The technical section requires constant updating as the programmes matures. The following items can be included as part of the technical section:

* A detailed breakdown of the charts and schedules used to comprise the Programme Master Schedule,possibly including schedule/cost estimates.

* A listing of the pilot testing to be accomplished for each activity.

* Procedures for accomplishment of the pilot testing. This might also include a description of the key elements in the operations or production plans, as well as a listing of the facility and logistic requirements.

* Identification of materials and material specifications (This might also include system specifications.)

* Although uncommon, some programme plans attempts to identify the risks associated with specific technical requirements. This has the tendency to scare personnel who are unfamiliar with the technical procedures.

The programme plan, as used here, contains a description of all phases of the program. For many programs, especially large ones, detailed planning is required for all major events and activities. Table II identifies the type of individual plans that can be required in place of a (total) programme plan. However, care must be taken in that too much paperwork can easily inhibit successful management of a program.

The programme plan, once agreed upon, is then used to provide programme direction. This is shown in Figure 8. If the programme plan is written clearly, then any functional manager or supervisor should be able to identify what is expected of him.

The programme plan should be distributed to each member of the programme team, all functional managers and supervisors interfacing with the programme and all key functional personnel. The programme plan does not contain all of the answers, for if it did, there would be no need for a programme office. The plan serves merely as a guide.

8. MANAGEMENT CONTROL

Because the planning phase provides the fundamental guidelines for the remainder of the project, careful management control must be established. In addition, since planning is an ongoing activity for a variety of different programs, management guidelines must be established in order to achieve unity and coherence.

FIG8

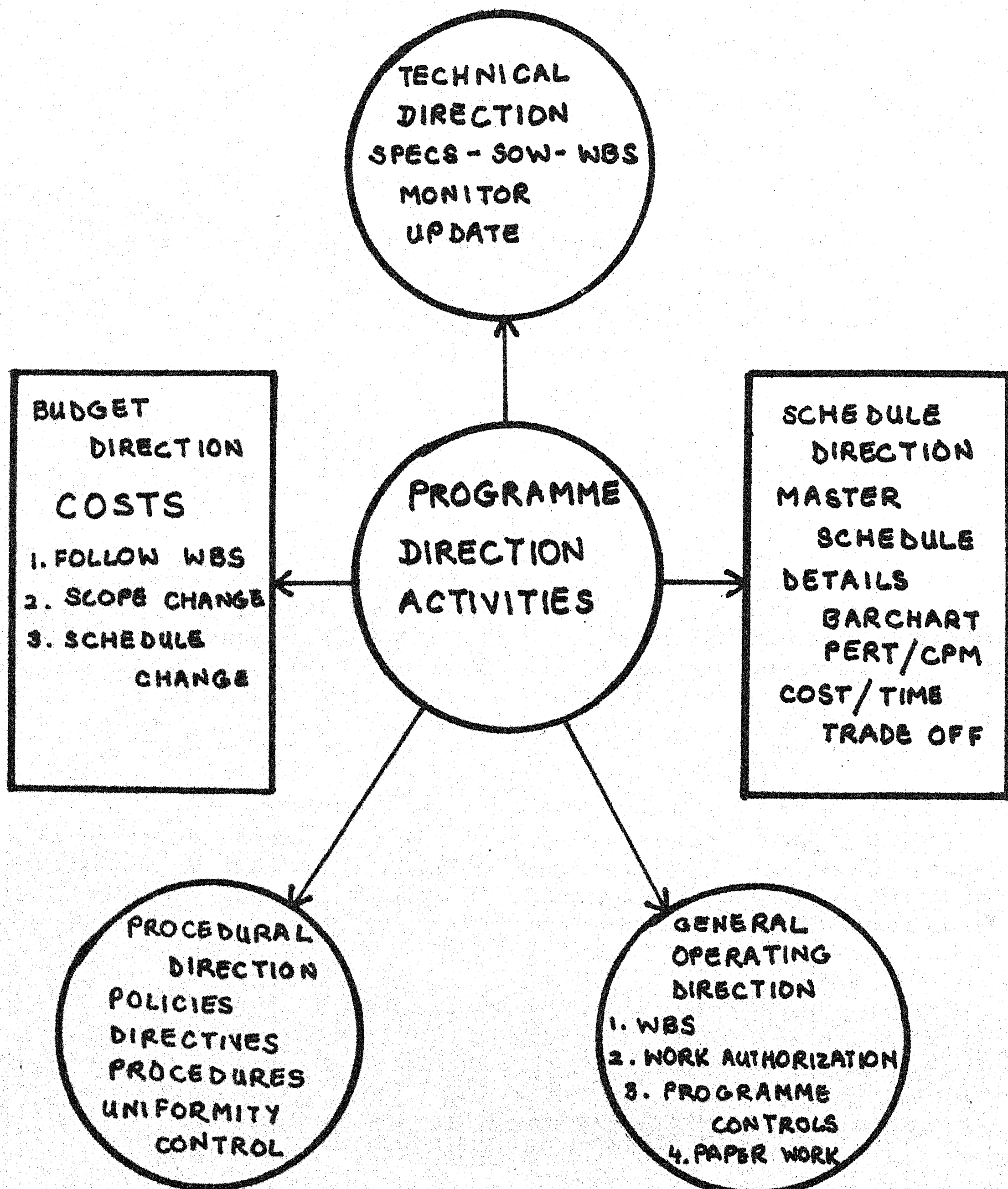


FIG - 8 PROGRAMME DIRECTION ACTIVITIES

TABLE II

	TYPE OF PLAN	DESCRIPTION
1.	Budget	How much money is allocated to each event?
2.	Technical Management	How are technical changes made?
3.	Facilities	What facilities and resources are available?
4.	Logistics Support	How will replacements be handled?
5.	Management	How is the programme office organized ?
6.	Cropping	What are the time-phase cropping events?
7.	Procurement Plan	What are my sources? When should I buy? If vendors are not qualified, how shall I qualify them?
8.	Quality Assurance	How will the quality of seeds be guaranteed?
9.	Research/Development	What are the technical activities ?
10.	Scheduling	Are all critical dates accounted for?
11.	Tooling	What are my time-phased tooling requirements?
12.	Training	How will I maintain qualified personnel?
13.	Transportation	How will goods and services be shipped?

All functional organizations and individuals working directly or indirectly on a programme are responsible for identifying to the programme manager, scheduling and planning problems which require corrective action during both the planning cycle and the operating cycle. The programme manager bears the final responsibility for identifying requirements for corrective actions. Management policies and directives are written specifically to assist the programme manager in defining the requirements. Without clear definitions during the planning phase, many projects run off in a variety of directions. Organisations should establish planning and scheduling management policies for the project and functional managers, as well as a brief description of how they should interface.

PROJECT CONTROL TIME MANAGEMENT

S. SAROJA

INTRODUCTION

Project Control includes time and cost control or more accurately "Time Management" and "Cost Management".

Time management relates to ensuring that the project is implemented in a timely fashion with respect to the project time targets. Cost management is the process of ensuring that the project is completed within the cost targets.

Both time management and cost management require development of a plan, execution of the plan, monitoring and control of the plan.

PROJECT SCOPE

Definition of project scope is the first activity in any project. Project objectives should be identified and each element in the project should be described comprehensively.

The project scope statement will form the basis of initial project planning and the subsequent breakdown of project elements into manageable packages for control purposes. Scope statements should generally cover the following:

a) Scope out line

b) Work to be included

c) Work to be excluded

d) Interfaces outside the project

e) Documentation to be produced

f) Documentation required from others

g) Overall cost targets

h) Time targets

i) Authorities and responsibilities.

PROJECT PHASE

It is common to define the logical progressive development of a project in terms of its phases. For example, the phases for a feasibility study project might be

- Collection of data
- review of data
- preparation of project document
- submission of project appraisal report

The various phases tend to be project specific and vary from project to project. The objective of defining project phases is to break the project down into manageable components.

WORK PACKAGE

The project is further broken down into work packages. Work package is a small component of a project which can be administered and controlled as a discrete element by a single person. A work package is often the smallest element of a project with its own budget.

A work package can be small or big depending on the situation. Its size should be inkeeping with the size of the project and the complexity of the scope.

WORK BREAKDOWN STRUCTURE

For Proper control large projects should be broken down into manageable packages. Even a small project should have a breakdown structure. This break down should include provisions for the planning systems, cost systems, contracts, purchasing, quality control, and other project components. The Work Breakdown structure (WBS) should include:

- document control
- purchase and procurement
- materials
- construction
- planning and scheduling

- activities
- design
- consultants/scientists
- information/data management
- accounting systems.

Conventionally a numeric or alpha-numeric numbering system is applied to WBS for reference purposes. The coding of the WBS should be compatible with all other coding structures, (e.g. code of accounts) in the project. It should be understood that the WBS and code of accounts are not the samething but they must be compatible with one another for effective management of the project.

A typical example is given below.

Figure 1

```
                              PROJECT
             ------------------------------------------
             :                     :                     :
             :                     :                     :
          DESIGN              PROCUREMENT          CONSTRUCTION
        -----------                :                     :
        :         :                :                     :
    DRAINAGE     TANK        --------------        --------------
                             :            :        :            :
                             :            :        :            :
                        MATERIAL 1   MACHINE 2    PUMP       GODOWN
                                                  HOUSE
                                                    :
                                                    :
                                               INSTALL PUMP
```

TIME CONTROL

Time management is the process of establishing a time based plan for the implementation of the activities to be performed and monitoring the performance against the plan. It also involves forecasting the timeliness of future activities and the completion dates associated with them. Time management should be applied to all phases of a project. Directing and controlling the execution of the time-plan leads to fulfillment of time-targets of different activities.

The following flow chart explains the process of time management

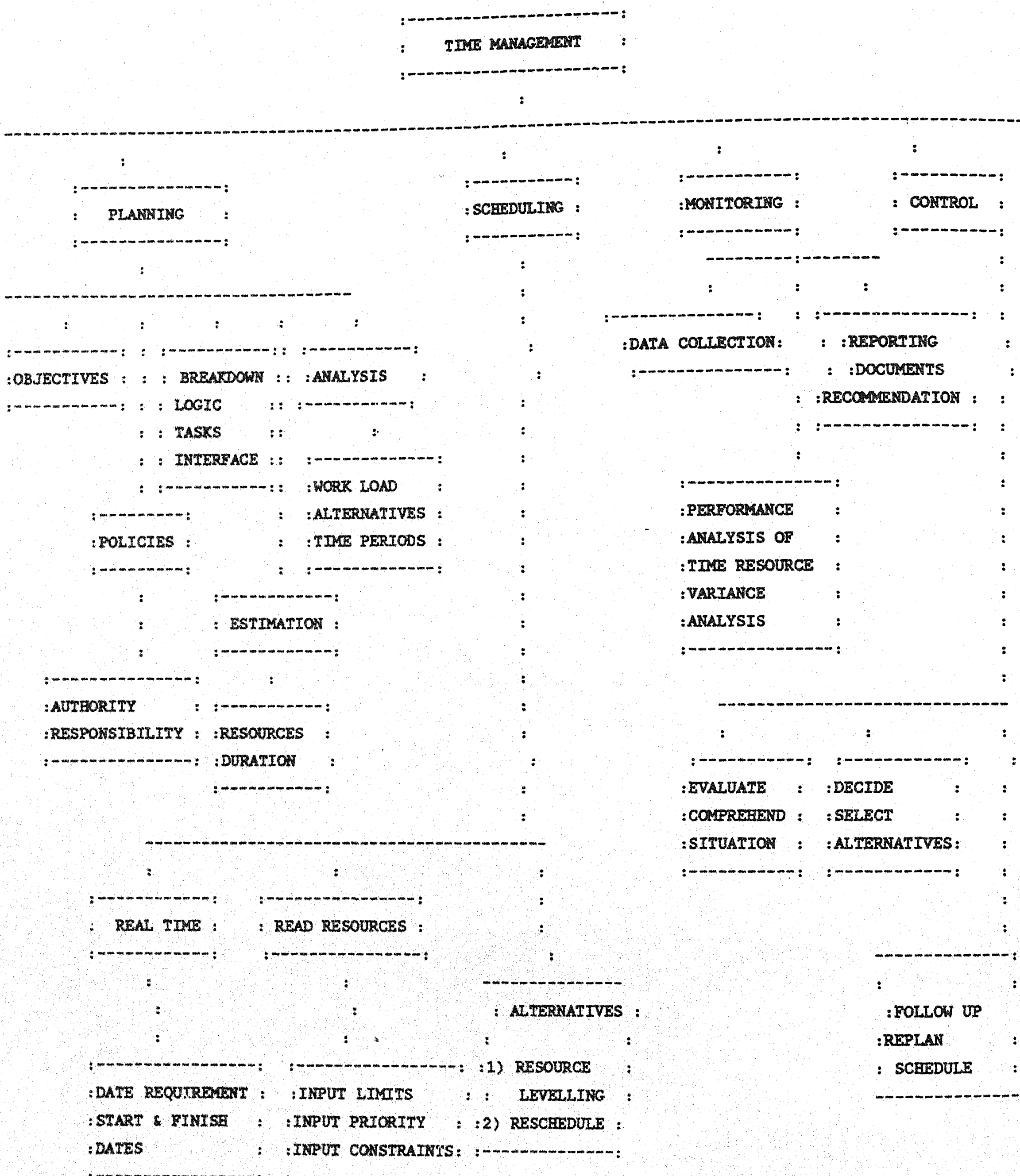
FIGURE 2
TIME MANAGEMENT - FLOW CHART

```
        --------
        : PLAN : ---------------------------------------------------------
        --------                                                         :
           :                                                             :
       -------------                                                     :
       : REVIEW TO :                                                     :
       : APPROVE   :                                                     :
       -------------                                                     :
           :                                                             :
        IS IT                                                            :
         OK    -----NO---------------------------------------------------:
           : YES                                                         :
           :                                                             :
      ------------                                                       :
      : SCHEDULE :                                                       :
      ------------                                                       :
           :                                                             :
      ------------------                                                 :
      : APPLY CALENDER :                                                 :
      : REAL TIME      :                                                 :
      ------------------                                                 :
           :                                                             :
          IS IT                                                          :
          OK?    ---NO---------------------------------------------------:
           :                                                             :
           : YES                                                         :
       -----------                                                       :
  :----  : MONITOR :                                                     :
  :      : PROJECT :                                                     :
  :      -----------                                                     :
  :        :                                                             :
  :    ----------------                                                  :
  :    : ANALYSE      :                                                  :
  :    : MONITOR DATA :                                                  :
  :    ----------------                                                  :
  :        :                                                             :
  :      IS IT                                                           :
  :      ALRIGHT  ----- NO -------------                                 :
  :                                   :                                  :
  :        :                     ------------                            :
  :        : YES                 : ANALYSE  :                            :
  :                              :VARIANCE  :                            :
  :        :                     ------------                            :
  :    ------------                   :                                  :
  :    : PREPARE  :             ----------------                         :
  :    : REPORTS  :             : SIMULATE     :                         :
  :    ------------             : ALTERNATIVES :                         :
  :        :                    ----------------                         :
  :        :                          :                                  :
  :        :                    ---------------                          :
  :        :                    : RECOMMENDED:                           :
  :        :                    : NEW COURSE :                           :
  :        :                    : OF ACTION  :                           :
  :        :                          :                                  :
  :        :                          IF                                 :
  :        :                          OK     ----NO----------------------:
  :        :                          :                                  :
  :        :                          : YES                              :
  :    -------------------            :                                  :
  :    : REVIEW OF THE   :            :                                  :
  :    : PROJECT BY      :------------:                                  :
  :    : MANAGEMENT      :                                               :
  :    -------------------                                               :
  :        :                                                             :
  :       IS IT                                                          :
  :-YES--  OK   -------NO------------------------------------------------:
```

The structure of time management function is also depicted in Figure 3. They are also examples of a Work breakdown structure.

FIGURE 3

TIME MANAGEMENT STRUCTURE



PLANNING

Project Plan forms the backbone for control against which all the activities are monitored during implementation. The project plan should include schedules, costs, tasks, reporting, communication network, scope, and quality. The time management plan should also include most of the above items, since the availability of all resources will lead to timely completion of the project. Planning consists of the following functions:

i) Establishing means of implementation and techniques,

ii) Establishing control criteria and methods of control

iii) Developing the activities and their sequences

iv) Preparing a diagram to depict the tasks and their sequences (bar chart etc.)

v) Estimation of task durations and time frames (number of days to complete each activity)

vi) Estimates of resources required to complete each task including manpower, facilities, equipment, money materials, etc. and also make estimates of resource constraints which affect the planning and scheduling of activities.

vii) Establishment of milestones at key points alongwith reporting to management on target start and finish dates and intermediate control dates.

viii) Identification of external constraints like climate, resistance to change, timely information etc.

ix) Delegation of authority and pinpointing of responsibility for achievement of tasks.

SCHEDULING

Scheduling is the function of applying real time frame while recognizing the constraints of the project. The actual schedule of execution of each activity in the plan is brought out in an integrated package. Start and finish dates of each activity will be worked out, taking into account the vacation days, non-working days and holidays. The plan will be put on to a real calender. Then real resource requirement for each task will be worked out. Resource constraints like availability and limiting factor will also be worked out and the schedules will be modified to include resource levelling calculations in the time computations. These calculations will determine the points in time that each activity will start and finish or each event will occur.

From this, time listings, bar charts, networks and graphs can be developed, which will be used in monitoring.

MONITORING

Monitoring is the process of continually comparing the execution of activities with the basic plan and schedule. Project is reviewed at intervals and forecasts for the future are developed. Monitoring includes collection of status data, progress data, and productivity data. It is necessary to update the plan/schedule to include actual achievement and findings about future work plans. Replanning should include the alterations in time and new schedules should be developed. New critical paths should be developed and actions should be taken to implement the new schedule. Reports giving details of achievements, new time forecasts and new schedules should be prepared and distributed to concerned personnel. If necessary, the report should be discussed with appropriate personnel.

CONTROL

All the above activities will provide necessary information for control. Then the project manager should comprehend the situation and recommend alternatives to be carried out by the project team. This should be followed up with replanning and rescheduling.

PLANNING AND SCHEDULING TECHNIQUES

There are several scheduling techniques which can be used to monitor the agricultural projects. Bar charts, Critical path method etc. have been applied to the management of complex and large projects. The application of these methods forces the project organisation to prepare logical, comprehensive and more complete plans. The CPM method throws light on all the logical relationships between all the network activities that control the plan. It facilitates quicker replanning and response to changed conditions.

PERT (programme evaluation and review technique) is also another network planning method that uses three estimated values of the activity duration -- optimistic, expected, and pessimistic. Network planning is carried out with diagrams which have arrows and circles to depict activities and events. Network planning diagram can be prepared on a time scale drawing and it becomes easy to relate to real time. Network planning can also be drawn in the form of a flow diagram regardless of scale. Schedules are developed by calculation of the network and presented in a suitable form such as a bar chart or data listing.

The development of a plan consists of the following steps:

a) List the tasks to be included in the plan. Establish work breakdown structure so that the tasks can be related the overall project.

b) Estimate the duration for each task for the plan. Time should be estimated very carefully taking into account the resources required to execute the task. These resource requirements should be notified against each activity if the plan is to recognise resource limitations.

c) Estimate the limits of resources that will be available for the project.

d) Establish milestones constraints which are to be applied in the scheduling phase.

e) Identify executive control and other monitoring points.

f) Establish the sequence performing the activities and prepare a logical network of the activities and their logical relationship. Prepare the network diagram.

g) Establish time frame in absolute time units. For example, how many days, weeks, or months that are available.

h) Calculate the network to identify the critical path and see whether it is longer or shorter than the time allowance for the project. If there are more than one critical path, then consider one by one. Find out how much improvement must be accomplished in the critical path to fit the plan to the project time frame. Review each path to determine adjustments and modify individual activity durations, if necessary.

    a) Give start, finish and other required milestone control dates to the plan.

    b) Apply real calender to the plan. The calender should recognise non-working days such as weekends, holidays, special weather restrictions etc. (monsoon rains). Different calenders can be applied to various activities. For example, construction of pump house could be planned on a six day work-week but agricultural activities like sowing etc. on a seven day, twelve hour per day work-week calender.

    c) Calculate the actual schedule, start and finish dates for each activity in the plan. The earliest possible and the latest required dates and floats should be developed based on the network logic.

    d) If there is resource levelling recalculate the network with the necessary limitations. The new dates will be different from those in (c) above.

e) Prepare the reports on schedule and resource allocation and reallocation date.

We can also use computer for scheduling if the project is very large and complex.

REPORTING AND CONTROL

When a fully detailed CPM network has been developed and scheduled, the monitoring and control phase takes over. These phases can also be carried out at various levels. Levels of detail for control are dictated by the requirements of the tasks to be performed and by the time frame of the project. We have to prepare a control and coordination plan to ensure that intermediate milestones can be met. A timely feed back system is very crucial for corrective action and replanning.

INFLATION AND PROJECT IMPLEMENTATION

-- A STRATEGIC ANALYSIS

S. SAROJA

A project essentially involves commitment of resources to derive future cash flow benefits. Projects could differ in terms of degree of investment. A project could, for example, consist of fully integrated rural development schemes to carried out in a remote corner. It could also be a discrete investment programme to enhance production of agricultural commodities. The basic characteristics remain the same, though complexity varies. Implementation is the crucial link between project conception and project profitability. Project implementation is often carried out within the framework of a preconceived project plan. The ultimate test, however, is in fulfilling the marketing objectives and profitability goals considered essential for survival and future growth. In a constant price situation, it is relatively easy, to relate project plans, project implementation and project profitability in a stable manner. However, inflation in project implementation can radically alter the project costs and profit projections.

Inflation is a chronic scourge in any developing economy, no less so in India. Economic growth in value terms present a rather unrealistic picture because increased output and profitability levels are derived in a good measure from inflationary effects. For example, although the agricultural production in value terms 1982 has increased by 21 per cent, the real value growth is only per cent. In the economy today, the inflationary spiral is seen in terms of:

a. escalation in input material costs.

b. increase in costs of infrastructure.

c. larger outlay for same volume of output.

d. higher initial costs of new technology.

e. increase in labour cost.

f. shortages leading to exploitative pricing policies.

Pure sectoral inflation is indeed very rare in developing economies. Inter-sectoral linkages ensure that the impact of inflation, in fact, cascades till the end-stage and also in relation to the number of inflationary factors involved.

Before considering further the ramifications of inflation and measures to manage inflation, it is necessary to focus on the existing inadequacies in inflation management.

"Inflation forecasting is a neglected area" in project planning. It is often treated "as an accountants numerator, which increases all costs and all prices equally, as if it has no effect" on the project organisation, farmer's behavior and investment. (Hussey)

The inadequacy in inflation management starts from the very point of project conceptualisation and planning. Accounting for inflation unfortunately focusses on one magic numerator to adjust for the impact of inflation. Obtaining the DCF rate of return under projected inflationary conditions is of no solace if the more critical issue of how inflation will alter the basic project itself is not analysed.

The impact of inflation is perceived differently in different situations. For example,

* at the macro level inflation in project costs means that the available national resources are spread too thinly over the projects, thus contributing to longer gestation, postponement of return and in general worsening capital output ratios.

* at the ongoing project level, it means that every phase of replacement programme is costlier to implement and results in a higher cost-price structure than the existing.

* at the new project level, it means that the very viability of the project which rests on certain cost-volume-time assumptions could be in serious doubt as inflation attacks all the three interlinked factors.

Inflation presents a difficult management paradox since projects have to be conceived in the long term, impact of inflation is often urgent, requiring immediate operational course corrections.

Inflation in project implementation in short, upsets the assumptions of the investment decision and requires a recourse to alternate funding strategies to manage the project completion. The management has to face the dilemma of replanning the project as a smaller integrated unit or pressing ahead with the original project irrespective of the impact of inflation. The answer to this dilemma is governed by the price-sensitiveness of the market to the end product. As price-sensitiveness increases, it becomes incumbent to change original programme objectives.

Inflation can be tackled only in terms of:

(a) economies of scale, pushing costs downwards; and

(b) cost-effective technologies, which have high development and

acquisition costs, but lead to optimal utilisation of inputs and higher productivity.

A partial answer also lies in incorporating inflation adequately in the project planning stage itself. It is, for example, possible to plan the project under tight inflationary assumptions; that is, reduce the market's capacity, to absorb inflation, and increase the impact of inflation on project costs. There are of course, problems associated with such an approach as they distort the process of selection of projects from a number of alternatives.

In order that the impact of inflation on project implementation is minimised, it is necessary to adequately consider it in terms of the following steps:

1. Define inflation as applicable to important project parameters, and develop methods to measure.

2. Forecast the future pattern of this measured inflation.

3. Identify the impact on the project and develop strategies for combating it.

4. Review original strategy and develop new strategies where necessary.

5. Carry out risk and profit sensitivity analysis.

6. Select a strategy.

7. Implement

While the steps look deceptively simple, problems of defining, measuring and forecasting inflation are numerous.

The tendency to go in for global indices of inflation to be used while planning must be avoided. Global measures are too general to be of relevance to the organisation. An ongoing organisation is particularly well adviced to develop its own internal inflation indices, which highlight variations in raw materials, labour and infrastructural costs. New projects should ensure that their preliminary surveys include a proper analysis of inflation in similar projects.

INFLATION AND PROJECT SELECTION

The heart of the inflation problem is its impact on future strategy. Inflation in project costs could change the total overhead costs and the cost structure leading to higher costs and prices. Inflation in prime cost factors would contribute more directly to increase output costs and prices. This could change the marketing

prospects drastically. The ultimate impact will be seen as a changed cash flow scenario.

It is, therefore, necessary under inflationary conditions to review profit objectives and reconsider the challenge of meeting growth objectives, in terms of real growth. Quite often under inflation, it is impossible to do better than stand still in real terms.

Expected continuation of heavy inflation must, at least for cash flow reasons, lead to serious reconsideration of how strategies might be implemented. The highlight of inflation could be that a number of previously rejected options may become more desirable.

When sustained inflation is forecast the strategy will shift towards the following alternatives:

1. Preference of quick implementation projects and relatively less risk investment opportunities.

2. Preference for projects that can be divided into several viable stages. This affords greater flexibility due to investment steps.

3. Preference for projects with a faster positive cash flow against projects with higher return but longer periods of negative cash flow.

4. A new look at methods of expansion which avoid or reduce capital investment. In order to reduce the magnitude of investment, serious consideration should be given to technology-oriented investments leading to higher productivity of existing assets rather than investment in new assets.

The above criteria, of course, generally qualify for a high rating on DCF methods. In the normal course only the DCF return would be the selection factor. But in situation of high inflation, more than high absolute DCF return, the above criteria could serve as filtering points.

Marketing principles for investment planning under inflation: The above discussion leads us to certain important marketing principles which need to be borne in mind for project planning under inflationary conditions. (Eg., edible oils)

The most important marketing factor in project planning is to determine the correlation between inflation and market behavior. This can occur in three ways namely:-

(1) structural change in the market,

(2) preference of competitive products, which have a lower rate of inflation and

(3) transfer of market allegiance to cheaper substitutes.

While these factors are not easy to forecast, acceptance of their possibility (or their probability) may lead to a completely different appreciation of future prospects for particular products, which can have far-reaching influence on R & D, marketing and production strategies.

In a tight market situation, which is compounded by inflation in project costs and a decline in the purchasing power, drastic steps on product strategy are called for. Some of the important avenues are:-

a) Assess anew the viability of each project to the future prospects. Inflation may turn the previously 'future bread-winner' into a doubtful prospect with a shattering impact on all aspects of strategy.

b) Review strategic product mix. Ruthlessly eliminate all poor performing projects for when inflation is rampant, they are more likely to get worse than better.

c) At the very least, define a project profitability strategy with a contingency plan that can maintain margins at a time when government control or market forces act to restrict price increases.

d) Establish cost-reduction as a tangible objective as it is a necessity for project survival under inflation.

e) Review marketing option in a multi-national background for inflation rates are not identical in all countries.

f) Assess future prospects only on the basis of some form of price plan. Identify inflation effects on price-volume relationships.

g) Drastically review aims, costs and efficacy of promotion, advertising, delivery and service strategies.

h) Determine if project diversification is necessary for creating new bread winner.

When the project is already under implementation, or is just implemented, inflation presents a fait accompli in terms of price and profitability.

<u>Investment Principles for Project Planning Under Inflation:</u>
Irrespective of the marketing strategy, however, effort should be made to reshape investments without affecting overall project objectives.

- First, employ critical path method to see if the project can be "crashed" so that gestation is reduced and a quicker return provided to compensate inflation.
- Review drastically make-or-buy decisions. Retain as far as possible end volume objectives by restructuring investments.
- Skip investments on new "doubtfuls". But add investments to reduce project costs.
- Do not pour money into research on items whose markets are killed by inflation.
- Discover new R & D opportunities.
- Seek a phased level of integration and an acquisitive R & D approach to gain some quick results.

CONCLUSION

Inflation is an inescapable feature of developing economies. It affects national planning as well as individual investment planning. Currently, inflation forecasting is a weak area in project planning. By a structured approach it would be possible to correlate project status to the influence of inflation. Such an identification of impact of inflation should lead to necessary strategy changes in marketing and investment. A product profitability plan and restructuring of product mix are the key principles for marketing under inflation. Crashing of project implementation, abandonment of doubtful investments, review of make-buy decisions and redirecting of R & D expenditure are key aspects of investment under inflation.

It is essential to recognise inflation as the change factor that can drastically affect project goals and viability. It is facile in today's complex environment to assume that all inflation will move costs and prices upwards in the same proportion leaving all else unchanged. It is necessary to adopt a strategic approach to inflation management, to derive maximum benefits from project implementation.

WATERSHED DEGRADATION AND WATERSHED MANAGEMENT IN INDIAN HIMALAYAS

D.C. DAS

ABSTRACT[1]

A summary of Watershed degradation problems such as soil erosion, sedimentation and land degradation through landslides, torrents, mining, shifting cultivation etc., have been provided to indicate the extent and severity of problems in the Himalaya. While accepting the necessity for developing physical resources through watershed management - (WSM), after examination with the concept potential population supporting capacity - (PPSC), the goals of WSM have been listed as i) to protect resource base ii) to develop and improve the base for enhanced PPSC and iii) produce for immediate sustenance and generate long term surplus, and cash for higher economic growth. As prerequisites to these goals, scientific assessment of watershed degradation, particularly erosivity of rains, erodibility of soils, watershed frame work, interse priorities, observed run off and silt load, and basis to quantify protective, productive and employment benefits, have been discussed and available tools or basis indicated.

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1.0 INTRODUCTION

1.1 The loss of value of land and water, including production potential and hydrologic behaviour, has been described as watershed degradation (FAO 1986). It is primarily the consequence of complex inter-actions of geo-morphologic and climatic attributes. However, the acceleration of processes of degradation through man induced activities is a historical testimony which are well perceived in different parts of this planet. These have also have been supported by various studies and investigations (FAO 1986, Das, 1986). Even in areas such as the Himalayas, which exhibit awesome natural degradation, the collateral occurrences of intense problems of erosion, sedimentation and land degradation with the increase of population and greater human activities, are inescapable (Das 1986).

1.2 Problems of watershed degradation vis-a-vis the physical, social and economic well being of mankind, finally boil down to harmonious and balanced inter relationship between Land Cycle and Water Cycle which can be depicted as follows:

```
Land Cycle <---V--->Water Cycle

Land Surface   E    Quantum of Water

               G
     +                  +
Soil Profile   E    Distribution

               T

               A

               T

               I

               O

               N

           (FORESTS)

      Production Potential

               and

     Conservation Necessities
```

Therefore natural resources of watershed, which are vital to our survival and prosperitv, include Land, Water and Forests. Land is non-

renewable. Forests and water, though renewable, are quick to be lost forever in the context of specific demand, time and space. These resources in the Himalayas are under threat of physical, chemical and biological damages through the processes of

(i) Deforestation

(ii) Soil erosion from land under various uses

(iii) Sedimentation in streams, rivers, ponds, reservoirs; and

(iv) land degradation-gullying, torrents, land slides, mining etc. (Das, 1986).

2.0 DEFORESTATION

Physically the process of deforestation include repeated lopping, felling, removal of forest litters, browsing and trampling by livestock, fire etc. (Ramsay, 1985). Examination of annual rate between 1976 - 80 and 1981 - 85 reveal that, in India annually 0.147 million ha. of forests are being deforested (FAO, 1986). A number of studies in India and Nepal, established that increased demand for food, livestock and firewood is the direct cause of deforestation. This could be realized from the results of a study made in Central Nepal. An average family with farm holdings of 1.25 ha. and 5-6 heads, requires 0.4 ha. for timber, 0.3-0.6 ha. for fuel, and 3.5 ha. for fodder and grazing (Wyatt-Smith quoted from, Ramsay, 1986). Therefore, Swaminathan (1985) observes that to prevent many parts from deforestation, it would be essential to provide adequate water, food, fodder, fibre and fertilizer for the people on recurring basis. There is, however, a school of thought which contests the concern for deforestation in the context of soil erosion and land degradation in the Himalayas. The concern is stated to be "an intellectually satisfying concept" which has arisen from accepting repeated assumptions as facts (Ives and Messerli, 1981m quoted from Ramsay 1985). The observations is yet to be supported by ground data. On the other hand, the influence of deforestation on accelerated erosion and sedimentation has been well accepted in India after many deliberations and in the face of substantial data. Its influence on historically large floods is, however, not so well established (GOI, 1978, 1980). Therefore, there is no point of getting involved in such academic exercises. The need of the hour is to go along with plans of action on ground to counter this hazard on priority basis. It appears, however, that our understanding of the complex role of forests and adverse effect of human activities such as deforestation, on soil erosion, sedimentation and hydrologic response variation, need to be improved both conceptually as well as quantitatively. So appropriate studies and research programmes should be taken up concurrently.

3.0 SOIL EROSION

Evidences of soil erosion (tearing off and displacement from parent site) in various forms are extensively seen all over the region. Some of the important one are as follows:

3.1 Denudation rates: The rate of lowering of earth's surface or denudation in recent times has been estimated to range from 0.21 mm/yr for Satluj to 20 mm/yr for slide prone slopes of Darjeeling. Average denudation rate for the world varies from 0.1 to 1 mm/yr. These rates are about 5 times the rates estimated for the past 40 million years (Ramsay, 1985, Valdiya, 1986).

3.2 Soil loss: There are not been any systematic surveys at intervals to assess the type, extent and rate of soil loss over the year. Some evidences have, however, been collected for the NE Himalaya. The soil loss rate from mountain slopes under shifting cultivation was 13 times the rate form the slope fully benched and 10 times the rate from the top sequential land use pattern where only bottom third is terraced (Singh and Singh, 1981). For Central Himalaya, on the border of India and Nepal, the soil loss ranged from 7.8 t/ha./yr from forests under heavy biotic damages to 38.3 t/ha./yr where land slides and torrents were also present (Sachdev et al, 1986). Contrary to the views that shifting cultivation, where dribbling is restored, soil loss is not likely to be high, the observation collected in the NE Hills of India show that it could be as high as 201 t/ha./yr (Singh and Singh,1981).

3.3 Loss of land productivity: Land productivity is firstly lost through the loss of inherent nutrients along with the eroded soil. Annually country loses major nutrients (NPK) between 5.37 and 8.4 m tonnes. Equivalent production ranges from 30 to 50 million tonnes annually (Suraj Bhan and Das, 1985).

In an interesting study in the NE Himalaya, where shifting cultivation prevails, the loss of nutrients over succeeding years under different crops, and cropping systems have been studied (Awasthi, 1986). Cropping over three successive years on slopes of 65%, showed that minimal cultivation (Slashing, burning and dribbling of mixed crops) accelerated soil and nutrient losses, resulting in fast decline in productivity. The reductions in productivity of different crops in descending order were cassava, maize, fox tail millet and paddy (Awasthi, 1986). In another study in the same region, under terrace cultivation the initial levels of carbon, cation and nitrogen were found to be lower than fields under shifting cultivation (even with 5 yrs fallow cycle), which further declined with cropping (Mishra and Rama Krishna, 1983). These results indicate that for management of soil fertility and land productivity mixed cropping and farming could be the necessity. The strength of traditional methods, where accumulation and cycling of natural nutrients take place effectively and help

regenerate the internal resources of the system, should be combined with improved technology, where a stable and smaller production base can be developed to support larger population (Wolf, 1986). The challenge for researcher on land husbandry is, therefore, not in glorifying or decrying either the traditional system like shifting cultivation or alternates such as terraced cultivation even though both have been time endured. The challenge is to combine the best of both and aim at maximising biological contributions in enhancing regenerating capacity of the farming system leading to higher land productivity and potential population supporting capacity of the available land (Higging et al, 1982).

4.0 SEDIMENTATION

4.1 Soil erosion is a pre-requisite to the process of sedimentation. The severity of sediment problems in the Himalaya can be realised from:

i) Silt loads in the streams and rivers draining Himalayas and

ii) Sediment Yield into reservoirs and

4.2 Silt load in the streams and rivers: Ganga, Brahmaputra, Indus and Kosi draining the Himalayas rank 2nd, 3rd, 5th and 12th among the sixteen rivers of the world experiencing severe erosion in their catchments (WCS, 1980).

The estimates of discharge and silt load of the first three rivers, however, vary widely (Das, 1986). Irrespective of these differences, it is clear that sediment load per unit of catchment area is high and the lowest estimate by Dhruvanarayana and Rambabu (1983) indicate a corresponding gross erosion of 16.35 t/ha./yr. This is far above the upper limit of soil loss tolerance. The major portion of the catchments is in the Himalayas. Further an estimate of sediment yield from Nepal Himalaya shows that about 240 m tonnes of sediment enter annually from Nepal alone into the Ganga System in India (Agarwal, 1982 from Das, 1986)

4.3 Silt loads in the streams draining small watersheds offer more closer information on on-site degradation. Thirty one such watersheds are being gauged in the Central Himalaya of India under the Centrally Sponsored Schemes of Soil Conservation in River Valley (RVP) and Flood Prone River (FPR) Catchments (Das et al, 1984). Peak silt load from 31 Watershed in the Soil Conservation Region of North Himalayan range from 9.5 to 65.16 ha. m/100 sq km/yr. Incidentally in all these watersheds, there are considerable human activities (Das, 1986).

4.4 Reservoir Sedimentation: Sediment production rates (SPR) for some reservoirs located on 10 Soil Conservation Regions were compared elsewhere (Das, 1986). SPR for the three reservoirs range form 1.45 times the assumed rate for Bhakra to 5.5 times the assumed rate for Beas. The variations could not be explained by the size of the catchment or percent of area under very high or high priority watersheds. Problem of siltation is more acute for smaller reservoirs. Slopes under shifting cultivation which are directly draining into the reservoir is responsible for fast siltation of Gumti while torrents and deforestation are chief reasons for other two (GOI, 1985).

5.0 LAND DEGRADATION

5.1 Loss of land productivity, qualitatively or quantitatively through various processes, such as erosion, wind blowing, salt affliction, water logging, sedimentation etc is defined as land degradation (Dudal, 1981). Land degradation can occur through activities for socio-economic development such as construction of roads and dams, mining, industrial wastes etc. Again some of the severe processes of erosion have other hazards associated which cause more extensive and lasting problems such as loss of flora and fauna due to shifting cultivation, total loss of land mass or disruption of settlements, water supply, communication due to gullies and ravines, torrents or land slides. These problems, which demand, more specific skill and high investment, are therefore, taken as land degradation (Das, 1986).

5.2 Land slides and slips: Due to continuous uplift pressure, river cutting and geological formations, the Himalayas are naturally prone to land slides and slips. The problems is extensive, severe and cost life and properties. In recent times landslides seem to have increased particularly along the roads. However, slides and slips have also occurred in forested slopes, terraced lands, cardamom plantations etc. (Gawande and Das, 1974 from Das, 1986). Watershed surveys in Darjeeling and Kalimpong areas, revealed that overgrazing, concentrated run off flow along livestock trail and cultivation of slopes greater than 20 degree without terracing are additional and immediate causes for slope failures. In Darjeeling failures in forested slopes were 10 to 20 times less than those under Tea plantations while forests were observed to inhibit mud flows and shallow slides following excessive rainfall (Dutta, B.N. and Starkel, L. quoted from Ramsay, 1985). Sastry et al (1986) painstakingly collated the increased deforestation, particularly on slope ends adjoining the valleys and aggravated slides at kalgargh, Dehra Dun over a period from 1919 to 1982. Not withstanding the differences in opinions on factors causing these problems evidences are plenty to suggest that regulation for human activities, particularly those connected with forest exploitation and disturbance to hydrologic responses of the slopes, could reduce the hazard to alleviate some of the immediate problems of the people living in the Himalaya (Das, 1986).

5.3 Torrents and Stream Erosion: Numerous streams rushing down the hill slopes are know variously such as 'Chos,' 'Khuds,' 'Kholas,' 'Jhoras' or 'Nalas'. These flows are characterized by fast flows with heavy sediment load. With the changes of sediment grades and sudden fall of gradients such as at interface of Siwaliks and plains, flow behaviours become erratic. These are marked by bank and bet cutting while devastations caused by those in Hoshirpur district or excessive siltation of Sukhnalake through 'Kasoli' or 'Sukhetri' chos are often reported. The problems is extensive along other Himalayan foothills of India. However, precise area affected by the problem is not known. The seriousness of the problem can be visualised from the fact that SPRS from such torrents were observed to range from 22.4 to 39.0 ha. m/100 sq.km/ya (GOI, 1985).

5.4 The gravity of stream erosion is realised from the devastations caused along the course of Kosi, the river of sorrow. From the observations along a reach of 152 km from the foothills at Chatra, Nepal to Jhamta, it appears that the river strives for a balance through diluviation and alluviation. The wide variations in the ratios of scouring silting, reveals that instability in river regime consequent, to erratic discharge and sediment flows from the hills above and resultant shifting of its courses (Das, 1986). Similar problem is extensive in the foothills above the Brahmaputra valley and doabs of north of West Bengal and Sikkim.

5.5 Shifting cultivation: Besides erosion a number of species of flora and fauna have become extinct in areas subject to shifting cultivation while in areas ecological retrogression have reduced the productivity of the land. The main problem is due to reduced fallow cycles such as between 9.74 and 1.64 (Mishra, 1976). Viability of shorter fallow cycle than 15 yr or 10 yr to ensure natural regeneration is the chief problem (Mishra and Ramakrishnan, 1983). On the other hand estimated population supporting capacity of such lands is as low as 3 persons/sq. km in Mikir hills to 16 in parts of Mizoram (Bose, Shah N quoted from Jha, 1976), against the population density varying from 6 to 48 persons per sq. km. Field surveys of six locations revealed that inspite of taking 11 crops together the aggregate production ranged from 9.72 q/ha. to 14.82 q/ha. while that of paddy from 4.08 to 10.97 q/ha. (Saha N quoted from Das and Purna Lal, 1986). Experimental results from N.E. Hills shows that toposequential land use plans, promoting Agro-Horticulture/Agro-Horti-Silvicultural systems, can yield much higher biomass meeting both the fertility regeneration demands of soil as well as that for food, fodder and horticultural produces. (ICAR, 1984). The surplus promises the possibility for generating cash and re-investment in hills for economic growth. (Planning Commission, NEH Res. Complex quoted from Das and Purna Lal, 1986).

5.6 Mined Area and Mine Soils: Notwithstanding the economic compulsions, mining on hill slopes disrupts the natural physiographic linkage amongst mountain slope, plateau and plains.

It affects productive soilbase, and hydrologic response. For every tonne of salable ore, about 2 tonnes of mine spoils must be dumped destroying vegetation on slopes, scarce cultivated or orchard land, chocking streams etc. From a small area of 25 ha., where lime stone was being quarried, as much as 740 tonnes of boulders came down in one year. Even a small rainfall of 10 mm could cause a suspended load of 1.10 gm/cc in the stream draining the area which increased to 3.20 gm/cc for rainfall of 70 mm. (CES, 1985, Sastry et al, 1985). Mining was also reported to reduce food production by 28% in Doon Valley, water resources by 50% and livestock population by 35% (J.B Bondhopadhya quoted from CES, 1985). At the beginning of 1980 area under working mining leases was about 3203 sq. km (Mukherjee et al, 1985).

6.0 WATERSHED MANAGEMENT

6.1 The very production base - soil in the Himalaya must be retained at site physically against the forces that erode or degrade it. Again the critical input for utilisation of land, water and the forests, multiple and complex promoter of physical, biological and environmental capability of a given area or land productivity, have become scarce where it was plenty or adequate.

6.2 There are visible strain on available resources base whether it is under settled agriculture, or fully or partially livestock based or under shifting cultivaiton. The main reason is rising population and growing aspirations of the communities for socio-economic development. These mountainous areas will continue to support large population not withstanding the fragile ecological base. In this context it is necessary to examine the "Potential Population Supporting Capacity (PPSC)" of these areas. A scientific exercise was carried out jointly by FAO, UNFPA and IIASA for developing countries (Higgin et al, 1982) for two time frames ie. 1975 and 2000 AD and at three input levels. Twelve attributes have been considered. The exercise was carried out for rainfed farming systems after taking into account the contribution through existing and potential irrigated farming in various regions of the country. The water resource potentials in the Himalayas, for the use of hill areas itself, is not that plenty as it appears from rainfall and snowcaps in many parts. Mountain communities had shown remarkable originality and grit in utilising glaciers or snow melts (Laddak, Lahul Spiti) and in using hill streams/springs (Uttar Pradesh, Himachal Pradesh and Ziro Valley). Inspite of these and the potentials which are yet to be tapped, large areas in the Himalays will continue to be rainfed (PC, 1982, 1985, Das and Purna Lal, 1986).

6.3 The mountains, with their low input levels, were identified as critical and unable to support the population as on 1975. The remedial measures suggested in middle and high input levels to enhance PPSC include long term conservation measures and optimum

mixture of crops. Interestingly in the Himalayas (except greater part of NE) terracing has been in vogue for centuries while raising a combination of crops as a risk cushion against weather aberration was also in practice. Besides traditional crop-livestock based farming systems, do heavily rest on forests. Inspite of these the productivity is declining or inadequate in greater parts. With the developmental activities, the sustenance but self reliant economy are getting fast replaced by expenditure economy. The analysis seem to be deficient in not taking into account the potential aggregate biomass that can be grown from a given hill farming system and meet the multiple needs including that of fertility regeneration. It has considered agricultural crops, only fruit banana and grassland which do not represent the Himalayan farming systems adequately (Das and Purna Lal, 1986). Nevertheless the principles and framework of the exercise could help us workout PPSC considering the more integrated farming systems with multiple linkages amongst crop (including cash and horticultural crops), Livestock (including fish) and forests, particularly in and around the farming systems and effective and larger re-investment to generate surplus which can be invested on land based or allied activities for generating employment, income and thus ushering a growth promoting economy (PC, 1981).

6.4 In a subsequent application of the approach, population supporting capacity (PSC) for irrigated and rainfed lands were worked out with the current and progressively increased per capita grain consumption for three time frames 1980-81, 1990-91 and 2000-01 (Suraj Bhan and Das, 1985). PCS for irrigated land is expected to increase by 0.95 person/ha. in 2001 while for rainfed areas the increase is 0.72 person per ha. It may be mentioned here that the increase in irrigated area is not commensurate to the heavy investment while that for rainfed areas investment is far lower. In India, 70 percent of net sown area is rainfed and large population depend on these areas. Thus enhancement of PSC of rainfed area particularly in the Himalaya would be very important. Further in the drive for achieving a quantum jump in production, the GOI (quoted from Suraj Bhan and Das, 1985) have identified nine factors for action in Seventh Plan. Out of these the following three have been considered to be more important ones:

i) Irrigation

ii) Land stock added or improved through reclamation and soil conservation

iii) Fertilisers

Now irrigation over larger area can be possible when available water resources are physically conserved, harvested and managed well. While irrigation and fertiliser can be effective if the appropriate soil base is preserved.

6.5 Watershed Management: The problem, therefore, boils down to develop and improve the land resources physically with associated development of chemical and biological environment as well as more appropriate hydrologic conditions. While planning can be done on any unit that the planner would choose. for physical development of land-water-forest resources base. watershed is an appropriate natural unit (Gil, 1979). The technology of watershed management combines protective measures with productive measures through necessary correctives and additives to the existing bio-physical base. (Das, 1986,FAO, 1986). There is some apprehension that the watershed as a unit conflicts with the prevailing political and administrative framework. The former is a rational base to obtained monitor biophysical characterisation while the latter is the basis for collection and retrieval of socio-economic data as well as monitoring financial matters. Neither is sufficient by itself and a degree of collation between the two systems is inescapable irrespective of the framework chosen. However, watersheds and catchments are natural boundaries and therefore, more permanent than states, districts and villages. Besides a catchment can be delineated in sub-catchment, watersheds, sub-watersheds, micro-watersheds, etc. The sizes of units could be so chosen that should facilitate formulation, implementation and monitoring of fields programmes within the administrative framework with some coordination at macro and micro level (Das, 1986).

6.6 Watershed management must, however,fulfill the following three objectives for the Himalayan communities:

i) To protect the resources base and minimise the hazards

ii) To develop and improve the base for enhancing its PPC

iii) To produce for a) providing immediate sustenance needs of the people b) While introducing measures to generate surplus to induce growth promoting reinvestment toward generation of larger employment and income.

6.7 Delineation and Codification of Watersheds: A first requisite for watershed management is a framework of watersheds keeping parity in expression and simple norm for identification of the geo-hydrologic units. All India Soil and land Use Survey (AISLUS) have developed national atlas of watersheds using six stages ie. Region, Basins, Catchment, Sub-catchment watershed and sub- watersheds (Bali and Karala, 1976).

6.8 Interse Priorities of Watersheds: AISLUS have also evolved a method to work out a weighted sediment yield index for each watershed computed from erosion intensities and delivery ratio of each mapping unit in a watershed (Kerala, 1985). These methods are in use in 36 major catchments of India including 8 in the Himalayas.

7.0 SCIENTIFIC ASSESSMENT OF WATERSHED DEGRADATION

7.1 Package of Technology to Tackle Conservation Problems: Prerequisite to any planning for this purpose is the reliable data on the type, extent and intensity of problems. Two primary factors on which information is urgently needs are:

i) Precipitation - its erosive and transportation

ii) Soil and soil profits - its erodibility and ability to redistribute incident precipitation favourably.

It is therefore an immediate objective to examine available information and tools that can be used in the region.

8.0 EROSIVE RAINS

8.1 A storm becomes erosive, when it produces enough impact through the combination of mass, energy and intensity or rate of delivery to detach and displace the soil particles. A large number of parameters were tried particularly in USA "Intense Rain" of Yarnell and "Excessive Rain" by USA. Weather bureau, were more widely used (quoted from Das et al, 1967). The determination of rains which could produce runoff and cause erosion was subsequently done by a set of sliding scale of qualifying intensity (IQ) as per USA Weather Bureau definition for durations of 5, 10, 15, 30, and 60 minutes, (Bernett and Rogers, quoted from Das et al, 1967).

$$I \geqq Iq = \underline{0.2 + 0.01T} \times 60 \times 2.54 \text{ cm/hr}$$

When I is the actual maximum intensity and

T is the selected duration in minutes

In the Nilgiris Hills of South India, at elevation between 1500 and 2500m Intensities for 5 minutes were found more closely related to runoff and soil losses. In these hills rains generally of longer durations and low average intensities. Thus erosive rains were termed as "Important Rains" combining the implication of 'Intense', 'Excessive', and minimum volume of Wischmier of 0.5 inch or 12.5 mm as follows:

> " A rainfall is important (to cause runoff and soil loss) when it has a minimum amount of 12.5 mm and a delivery rate, equal to or greater than US Weather Bureau qualifying rate for a duration not less than 5 minutes" (DAs et al, 1967).

In various party of Himalaya both in India and Nepal intensities and energy were found to be lower at higher elevation specially compared to adjoining plateaus/plains (Ram Babu et al, 1978,).

Therefore, the definition of important rainfall could also be applicable to the Himalayan region.

8.2 Rainfall Energy and Erosion Index: Rainfall energy and Intensity products (EI) have been used to determine erosivity of rains for different locations. Though Intensity for duration for 30 minutes is widely used, in the hills energy and intensity for 5 minutes (E15) was found to be more significantly correlated with runoff and soil loss (Das et al, 1967a from Das, 1986). The term has been successfully used in estimating likely soil loss rates for a given conditions such as with Universal Soil Loss Equation (USLE). HOwever, the availability of directly measured intensity and energy data is very limited in the Himalaya. For terrain and other logistic reasons such data may not become available for many years more. Extrapolation of data from adjoining area is also not reliable due to effect of elevation as has been examined earlier (Das, 1986). An alternate basis for estimation from annual rainfall amount have been tried by (Ram Babu et al, 1978). Since the equation developed from data, that do not come from the Himalayas, reliability of the same is an unknown factor.

8.3 Intensity Ratio (IR) : Under the prevailing condition non-availability of basic data, application of EI is limited. For comparative studies of erosivity of rains in different parts can be made with IR as defined below: (Das et al, 1977 from Das,1986)

Intensity Ratio

$$\text{or, IR} = \frac{\text{I5 for a return period of 10 years for a place}}{\text{US Weather Bureaus Qualifying Intensity for duration of 5 minutes}}$$

$$= \frac{\text{I5 for 10 year return period}}{7.63}$$

Intensity data are also not readily available. But intensities for duration lower than 60 minutes can be determined from 1 hour rainfall which can be obtained from isohyetal maps prepared by IMD with long data series (Khullar et al, 1975). It however, cannot give quantitative estimates of likely soil loss.

8.4 Fornier's Index: Recognizing the established strong climatic influence on soil erosion processes, an index has been suggested to determine sediment yield (Fornier, 1982 quoted from Garde, 1986). This is an follows:

Fornier's Index

$$FI = \frac{(\text{Rainfall in the month of maximum rainfall})2}{\text{Annual Rainfall}} \times \text{Annual Rainfall}$$

This was found to be a better one than using rainfall alone. On the other hand strong correlation between vegetation or changes in land cover and runoff as well as sediment were reported by many (Das and Singh, 1980 from Das,1986). Observations have also been reported to the effect that maximum sediment yield occurs when the rainfall ranges between 250 mm to 350 mm (Langbein and Schum, 1958 quoted from Garde,1986). Another set of findings show strong relationship between the factors (Annual rainfall/annual temperature) with sediment yield (Flaxman, 1972 quoted from Garde, 1986). While in the Nilgiris a ratio of rainfall to mean temperature, called Effective Soil Moisture Factor (ESM) for a chosen time interval, was found to be strongly correlated with solid moisture, runoff and soil loss variations (Das et al, 1967a from Das 1986). However, analysis of data from 79 catchments did not establish the universality of any of these results (Jansen et al, 1982 quoted from Garde, 1986). Similarly analysis of observed suit load vis-a-vis watershed characteristics, climatic attributes, land uses were carried out for a large number of watersheds in the Soil Conservation Regions of North Himalaya, Indo-Gangetic Alluvial Plains, Eastern Red Soils, Southern Red Soils and Black Cotton Soils. Results include a number of multiple and variable regression models combining the watershed characteristics, Land Use and runoff. The runoff could then be replaced by reliable equation involving precipitation, temperature and watershed characteristics (Das et al, 1984, Ramasesha et al, 1985). In the face of these the immediate application of Fornier's Index in the Himalaya may not be possible. The quest for obtaining EI indices should be intensified while for the present IR could be used for finding relatively more erosion prone areas and comparing different sites.

9.0 SOIL ERODIBILITY

9.1 Soil erodibility has been studied very widely in India and abroad. Two recent reviews (Bhardwaj 1976 and Bhola, 1983) have brought out some of these results. The reviews have not incorporated the results reported while searching for design norms for many treatment measures and those consider hydrology and land characters. The reviews are restricted to those concerning soil characteristics alone. The earliest indices for soil erodibility are, Dispersion Ratio, Erosion Ratio, percent of silt-clay particles etc. Some of the oldest critical limits suggested by Benette (quoted from Bhola. 1983) are as follows:

TABLE SUGGESTED CRITICAL LIMITS TO DEFINE ERODIBLE & NON-ERODIBLE

Ratio	Erodible Soil	Non-erodible Soil
1. Dispersion ratio	> 15	< 15
2. Erosion Ratio*	> 10	< 10
3. Colloid:Moisture Equivalent Ratio	> 1.5	< 1.5
4. S O/ Fe203 Ratio	> 2	< 2

* This is also known as Middletonis safe limit.

All these parameters can be used to determine relativity but none can give the quantified amount that can be eroded under a given condition.

9.2 Erodibility Factor 'K': In USLE 'K' has been defined as Soil loss in tonnes per unit EI/ha./yr. The values of 'K' are generally obtained from observed soil loss under simulated rainfall. There have been considerable difficulties in applying the method and obtaining reliable information. In any case values of 'K' for the Himalayan sites are not readily available and prospect of getting these in near future is not bright. There have been noticeable correlation between various soil textural classes or names with computed values of 'K' (Bharadwaj, 1976). But these too cannot be applied in the Himalaya. However, from the soil properties and using the multiple regression or coaxial nomograph, values of 'K' for Himalayan soils can be obtained provided values of the host of soil properties are collected from extensive areas.

9.3 Soil erosion in the Himalaya can be put to two major physical factors besides erosivity of rains namely (i) steepness and (ii) overland flow. Formation of rills could be considered as the signal for heavy soil erosion. In New South Wales, spacing of banks (bunds) across land slope has been designed to prevent rill formation (Stewart, J, 1955 quoted from Das et al, 1977). This has a mathematical base as erosive power of overland flow varies with the square of velocity. Thus;

$$\text{Horizontal Interval} = \frac{K}{\sqrt{S}}, \text{ m}, \quad K = \text{Constant}, \quad \sqrt{S} = \text{Slope Per cent}$$

Experimentally basis for computation of 'K' - the constant has been obtained. A ratio called Rilling Hazard ratio or RH ratio has been used with others. RH has been defined as:

$$RH = \frac{\text{Erosion Ratio (ER) of a given Soil}}{\text{Middleton's safe ER or 10}}$$

Thus erodibility inherent to soil properties have been further adjusted here to the probable additionality due to overland flow which is critical to the steep Himalayan slopes.

9.4 Erosion Factor Fe: Garde (1986) used Fe factor to develop a regression equation using observed sediment yield from fifty small watersheds collected and documented by Soil and Water Conservation Division of Ministry of Agriculture, New Delhi, (Das et al, 1984, Ramasesha et al, 1985), Fe defined as:

$$Fe = \frac{a.\ FA + a2Fa + a3\ FF + a4\ Fw}{A}$$

Where, FA = arable area, FG = grass and scrub land

FF = Forest land and FW = Wasteland in catchment

A = Total area, a1, a2, a3 and a4 weights.

The value of weights determined from correlation co-efficients between Fe and S-sediment yield. An independent basis for determination of these weights would be necessary. Incidentally the approach has been in use since decades in computing weighted erosion intensity of a watershed in the Priority Delineation surveys by All India Soil and Land Use Survey (Karale, 1985). The desirability of using land use distribution for developing runoff and soil loss and for rational determination of Dicken's and Ryve's constants were also indicated at Ootacamund (Raghunath et al, 1970). The approach can be tried in the Himalayas.

9.5 ISO Erodent Maps and Soil Loss Estimation: Inspite of difficulties in determining 'R' factor - rainfall erosion potential and 'K' soil erodibility, a number of attempts have been made in India to estimate possible soil loss and develop ISO-erodent maps. The earliest attempt has been reported from Central Soil and Water conservation Research and Training Institute. Dehra Dun (Ram Babu et al, 1978). For Bhavani Catchment Sakthivadivel (1986) used USLE a little differently to group sub-watersheds with different erosion potentials. However in both cases computation of 'K' values continues to be the real weakness. Application of estimates from aerial photo interpretation too needs to be supported by adequate ground checking.

10.0 DELINEATION, CODIFICATION AND PRIORITY FIXATION

10.1 Delineation and Codification: A frame work of watersheds with standard norms of identification is the basis for investigation, planning and monitoring of works related to watershed management. AISLUS have prepared a Watershed Atlas of India using six-stage classification viz regions, basins, catchments, sub-catchments, watersheds and sub-watersheds (Bali and karale, 1976).

10.2 Priority Fixation: Similarly for assigning intense priorities of the watersheds, within a catchment, AISLUS have evolved and using a method that combines (i) erosion intensity mapping units with (ii) delivery ratio. Weighted Sediment yield Index (Syi) is obtained from (Karale, 1985).

$$SYi = \frac{(Aei \times Wei \times DR)}{Aw}$$

where Aei = Area of an erosion intensity unit

Wei = Weightage of erosion intensity unit

DR = Delivery Ratio

Aw = Total Area

Currently attempts are on to refine the methodology by using soft-wares obtained through other remote sensing methods such as satellite imagery and observed silt load data from small watersheds.

10.3 Zonation: For Macro level planning, allocation of funds and deployment of infra-structural facilities zoning of broadly similar bio-physical units and sub-units is a necessity. The boundaries of these units and sub-units will cut across the Basin/catchment boundaries as a river traverses from high mountainous region to flat plains and then to the sea. The exercise is needed for resources mobilization, implementation of programmes optimally as well as achieve better inter departmental and inter-sectoral coordination. The examples of such zonations are (Das, 1986):

(i) land Resources Regions (LRR) and Areas (LRA)

(ii) Agro-ecological Regions/Zones (AER)/(AEZ) and

(iii) Soil Conservation Regions (SCR) etc.

For land, water and forest resources management through watershed management, measures for conserving and regenerating continuously the resources base is a prerequisite to all packages of inputs leading to higher productivity (Suraj Bhan and Das, 1985, Wolf, 1986). Therefore, LRR and SCR are better oriented as critically of physical conditions govern the direction as well as scale of socio-economic development.

10.4 Problem Identification: The most difficult part is problem identification as the problems are complex due to the mixing up of social, economic and bio-physical demands. Time endured traditions, which have been evolved more as risk cushions against natural as well as socio-political upheavals, are also strong factors. Here comes the role of integrated land management systems which may ensure

i) protection to shallow soil depth and delicate water resources points

ii) provide compatible raising of food, fodder, cash crops as well as trees

iii) generate cash and surplus for re-investment on land or its allied activities

iv) help to regulate market forces and develop rural-urban linkages with balanced trade offs etc.

10.5 Monitoring: Appraisal of effectiveness of the programme will be on the bias of (i) Physical improvement and (ii) Socio-economic betterment.

The former demand information on the reduction of sediment yield, regulation of stream flow, restoration or protection of land etc. Besides re-distribution of land under different land management systems. Immediate need is for some bench mark data and building time series of hydrologic observations. Therefore, the existing network of 31 stream gauging and sediment observations posts in the northern Himalayan Region should not only be maintained but should also be improved in terms of facilities as well as strengthened by installing new ones wherever representative conditions have not been covered. There is no similar network in the North Eastern Himalayan region which have quite different, set of problems including that of shifting cultivation. Information on land restored, land brought under irrigation through water harvesting and better and double cropping should be collected at specified time intervals. Under socio-economics following data on followings could be collected at specified time interval.

1) Production of food and cashcrops including horticulture and plantations crops

2) Fodder and livestock

3) Fuelwood and timber

4) Aggregate production from representative types of lands covering singly or in combination the preceding three sources

5) Employment i) Regular on land
Casual on land

ii) Off land

In absence of these information, multiple benefit streams are converted into rupees and this cost effectiveness analysis remains incomplete and thus these programme fail to get either proper plan priority or plan allocations.

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SOIL AND LAND USE SURVEY FOR WATERSHED MANAGEMENT

ALL INDIA SOIL AND LAND USE SURVEY

DEPTT. OF AGRICULTURE AND COOPERATION

MINISTRY OF AGRICULTURE AND

RURAL DEVELOPMENT GOVT. OF INDIA

I.A.R.I. BUILDINGS

NEW DELHI 1985

NEED FOR SOIL SURVEYS

The importance of soil surveys for watershed management has been well established. In India one of the important watershed management programmes is concentrated in the catchments of multi-purpose River Valley Projects (RVP) dams/reservoirs. The excessive siltation of these reservoirs is progressively reducing their useful life. A few examples of wide disparity between the rates of sedimentation assumed in project design and the observed rates are shown below.

Project	Rate of sedimentation (ha. m/100 Km 2/year) Assumed	Observed
Beas	4.29	17.30
Mahi	1.29	8.99
Panchet	2.49	10.08
Tawa	3.61	8.10

The All India Soil and Land Use Survey Organisation (AISLUS) has been conducting soil surveys since 1958 to help implementation of soil conservation programmes in the RVP catchments.

PRIORITY APPROACH

Soil Conservation activities aimed at controlling siltation of the reservoirs and retarding flood hazards are planned in 37 catchments involving an area of about 86 million ha. The constraints of financial resources and technical personnel led to adoption of selective approach of confining treatment measures on priority basis in areas that yield comparatively high silt loads per unit area.

THE SILT YIELD INDEX METHOD

The AISLUS has developed a silt yield index methodology for demarcating the priority watersheds in each of the RVP catchments. It comprises systematic delineation and codification of subcatchments, watersheds and subwatersheds on 1: 50,000 scale drainage base maps prepared from Survey of India toposheets. The erosion intensity units are then mapped in the field using toposheets, aerial photos and other base material.

The erosion intensity mapping units are developed in the field on the basis of the following factors.

1. Physiography and slope
2. Surface cover conditions and present land use
3. Soil class-depth, texture, colour
4. Impressions of erosion

These mapping units are assigned numerical values implying their comparative but not proportionate silt yield potential. The likely delivery of the eroded material into the reservoir is judged as delivery ratio. The following factors are collectively considered to determine the delivery ratio.

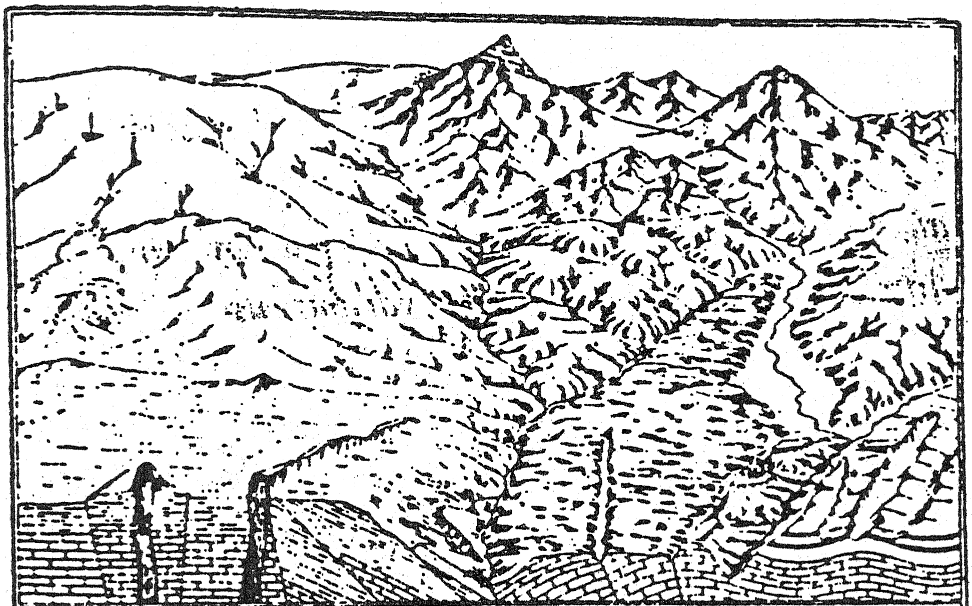
1. Nature of soil
2. Distance from the reservoir
3. Relief-length ratio and drainage density
4. Proximity of the active stream
5. Slope gradient and surface cover conditions
6. Existing lakes, ponds and silt traps.

The silt yield index is finally computed by using the following empirical formula.

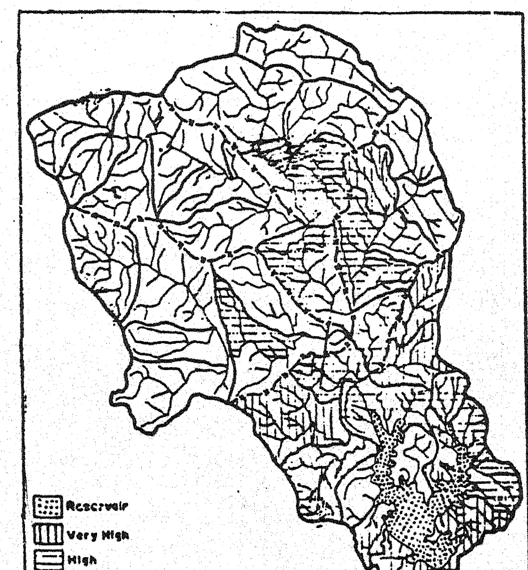
$$Syi = \frac{(Ai \times W \times DR)}{Aw} \times 100$$

Where,
- Syi - Silt yield index
- Ai - Area of the mapping unit
- W - Weighted value of the mapping unit
- DR - Delivery ratio
- Aw - Area of the watershed

Figure 1 & 2



ERODING LANDSCAPE



PRIORITY DEMARCATION
MAP OF MAYURAKSHI CATCHMENT

he map illustrated above shows demarcation of the very high an

Higher the value of the Syi, higher is the priority of the watershed.

The priority gradation of the different watersheds in Mayurakshi catchment is shown below.

Priority Category	No. of watersheds	Area (ha.)	% of total
1. Very high	8	20032	11.4
2. High	17	52014	29.5
3. Medium	22	73832	41.9
4. Low	3	23040	13.1
5. Very low	1	7168	4.1
	51	176086	100

The map illustrated above shows demarcation of the very high and high priority watersheds in Mayurakshi catchment located in Bihar State.

The AISLUS is responsible for carrying out such priority delineation surveys in 36 RVP/FPR Catchments and has covered about 59 million hectares upto March, 1985.

The extent of areas under very high and high priority watersheds in some of the important RVP catchments is furnished below.

Name of	Total area	Area (000 Ha.)		%Very high + High
		Very High	High	
Beas	10.70	2.20	2.30	42.0
Mahi	24.70	4.00	4.50	34.4
Panchet	5.26	0.59	1.75	44.5
Tawa	5.40	0.60	1.50	38.9

DETAILED SOIL SURVEYS

The detailed soil surveys are conducted in selected priority watersheds for providing basic data on soil and land characteristics for micro-level watershed management planning and treatment. Such surveys are conducted using cadastral maps or aerial photographs in the scales ranging from 1: 4000 to 1: 15000 and published in the form of reports and maps.

The reports contain following basic information

1. Physiography
2. Climate
3. Natural vegetation
4. Agricultural and Socio-economic conditions
5. Detailed descriptions of the soils
6. Soil survey interpretations for various uses
7. Problems and problematic area

The information contained in the reports is particularly useful for knowing:

1. Potentialities and conservation needs
2. Suitability of lands for agriculture, forestry, pastures and other uses
3. Suitability gradings for irrigation
4. Suitability gradings for different crops including rice
5. Run off potential

The AISLUS has covered nearly 4.1 million hectares during 1969 to 1985.

GOVERNMENT OF INDIA

SOIL AND WATER CONSERVATION DIVISION

DEPARTMENT OF AGRICULTURE AND COOPERATION

SOIL CONSERVATION PROBLEMS

"Rapid economic development without ecological damage can be reached only if conservation becomes a way of life with every man, woman and child.

-- Smt. Indira Gandhi

	1980-81	By 2000 AD
Population (million)	684	1000
Foodgrain Production (million tonnes)	146	240
Net area under cultivation (million ha.)	140.27	150
Area under Forest (million ha.)	67.42	118
Area under pasture grassland (million)	12	22
Geographical Area (million ha.)	329	329

To meet increasing demand for food, fibre, fodder, fire wood and timber by 2000 AD an additional area of 60 million ha. is needed.

More land will also be needed for habitations, industry, roads etc.

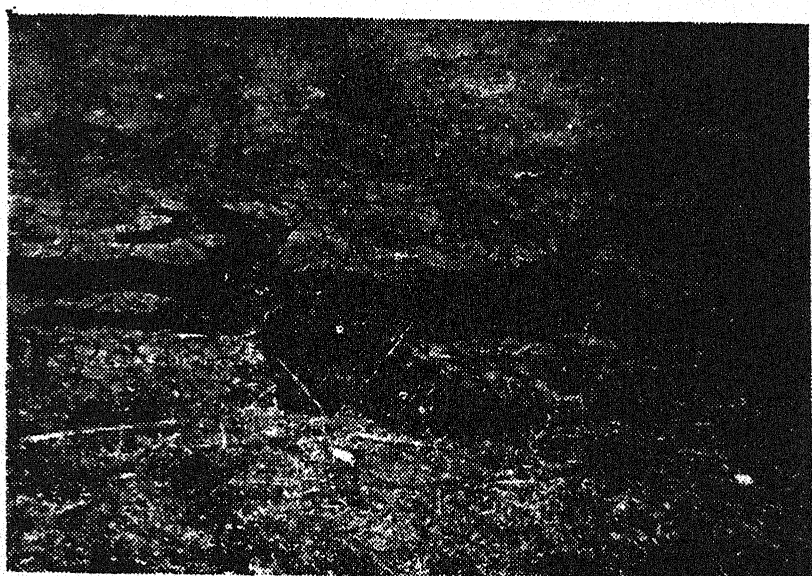
Land surface need to be managed judiciously to meet these competing demands and to prevent these getting degraded permanently.

While we need more land, large areas remain waste or underutilised, for the year 1980-81, the unutilized areas are as below:

	Area in million ha.
Culturable waste lands	16.72
Fallows other than current fallows	9.82
Barren or unculturable waste Lands	20.17
Total	46.71

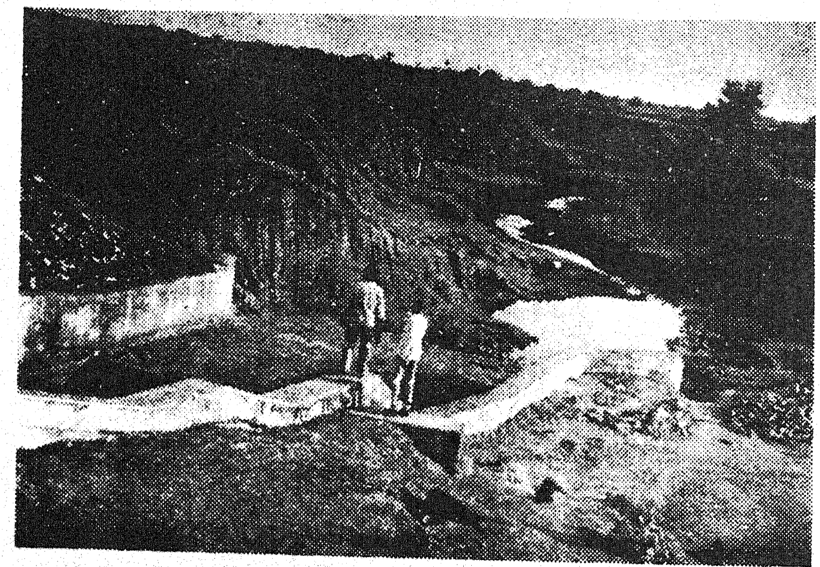
Mean while soil erosion and land degradation continues to reduce productivity, over 175 million ha. or 53.3% of the country's total geographical area.

SHEET AND POT HOLE EROSION IN SOIL CONSERVATION REGION OF BLACK SOILS.



GULLY EROSION IN THE SOIL CONSERVATION REGION OF EASTERN RED SOILS.

Figure - 2



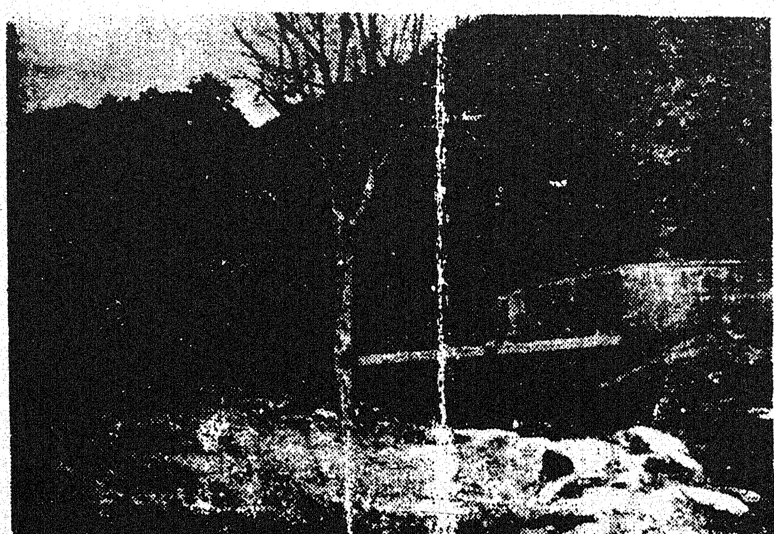
DEGRADATION OF HILL SLOPES DUE TO SHIFTING CULTIVATION IN THE SOIL CONSERVATION REGIONS OF NORTH EASTERN HIMALAYAS.

Figure - 3

		In million ha.
Area subject to water and wind erosion-		150
Area subject to degradation through special problems.		
- Shifting cultivation	4.33	
- Ravines and Gullies	4.00	
- Water logging	6.00	
- Salinity including coastal sandy saline areas	5.50	
- alkalinity	2.50	
- Riverine and Torrents	2.73	
	25.06	25
	Total	175

Denudation of forest, over grazing at pastures and community lands and cultivation of marginal and steep lands without protection are disturbing interaction between 'land cycle' and 'water cycle' consequently siltation of multipurposes reservoirs, floods and droughts are recurring and extensive.

SOIL & WATER CONSERVATION PROGRAMME AND PROGRESS



About 40 million ha. prone to floods, 260 million ha. prone to water stress/drought.

Nearly all reservoirs are having, far higher sediment inflow than assumed rates

Preventing erosion on land annually could save.

	In million tonnes
- Soil loss about	6,000
- N.P.K. between	5.37 & 8.4
- Equivalent Agricultural production	32 to 50

Developing and restoring Ravines could help to produce annually three million tonnes of food grains besides much more fodder and fire wood. Settling about 0.62 million families of Shifting Cultivators on a million ha. would release 3 million ha. from Slash and burn type farming for good forest plantations. Besides it will preserve natural flora and fauna.

SOIL AND WATER CONSERVATION PROGRAMME AND PROGRESS

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT

(DEPARTMENT OF AGRICULTURE AND COOPERATION)

OBJECTIVES

(i) Enhancing productivity of available land for primary production systems of cropping, forestry and livestock management.

(ii) Generation of employment and income in rural area.

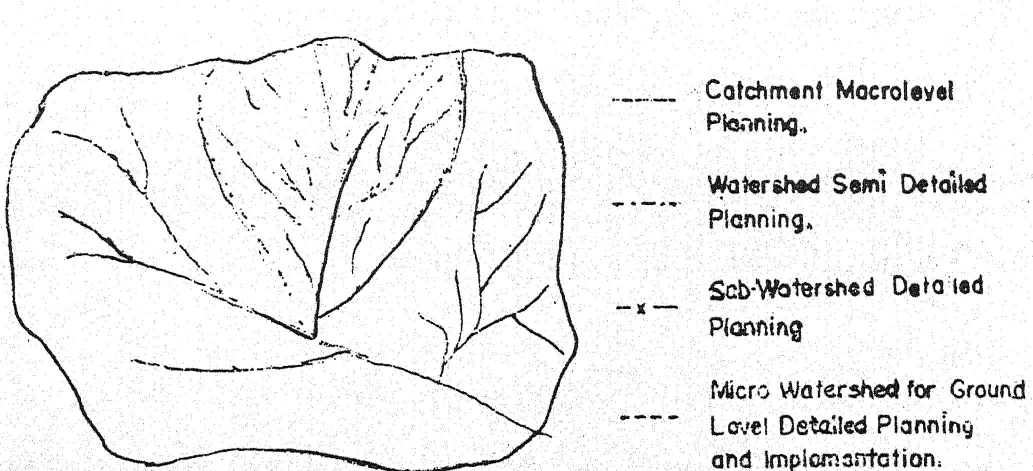
(iii) Maintaining beneficial relationship between land and water cycle and reduce soil erosion and land degradation.

(iv) Locating, identifying and developing culturable wastelands and fallows other than current fallows to meet increasing and competing demands for land from different sector.

APPROACH AND BROAD METHODOLOGY

(a) Identification of group of problems with package of treatments for 10 Soil Conservation Regions of India.

WATERSHED MANAGEMENT AT DIFFERENT LEVELS



(b) Planning, implementing and monitoring of Soil and Water Conservation programmes on the basis of priority/responsive watersheds/micro watersheds and with a multidisciplinary watershed management planning.

- Catchment Macro level Planning.
- Watershed Semi Detailed Planning
- Sub-Watershed Detailed Planning
- Micro Watershed for Ground Level Detailed Planning and Implementation.

PROGRAMMES - CENTRAL

1. Soil and Land Use Surveys

(a) All India Soil and Land Use Survey Organisation

- catchment delineation and codification
- Prepared a National Watershed atlas of the country with 3200 watersheds ranging size $2X10^4$ to $2X10^5$ ha.
- Priority delineation surveys carried out over 55 million ha. and identified 3772 watersheds in very high and high priority categories upto 1983-84
- Detailed soil survey over about 7.3 million ha. upto 1983-84.
- Joint programmes with Indian Space Research Organisation and Space Application Centre on Remote Sensing.

(b) State Soil Survey Organisation:-

- To increase capability with states, Central Govt. provided assistance to the State during Fifth Plan.
- Assistance is given to Union Territories of Andaman and Nicobar Islands, Goa, Daman and Diu, Mizoram and Pondicherry during Sixth plan.

2. Treating Catchments of River Valley Projects

- to reduce siltation of reservoirs, ensure continued irrigation to commands and power generation and to improve productivity of catchments.
- Presently in operation in 534 watersheds of 28 catchments in 17 States, Chandigarh Union Territory and Damodar Valley Area.

Planning on the basis of priority watersheds.

- Implemented with integrated watershed management plan for agricultural, forest, waste lands and channel system.

- Monitored physical and financial progress, and for changes in silt load and run off from watersheds and improved productivity of the watersheds.

- Till 1983-84 area treated 1.84 million ha. within about 6 million ha. of priority watershed area at a cost of Rs. 1600 million.

3. Integrated Watershed Management In Catchments of Flood Prone Rivers.

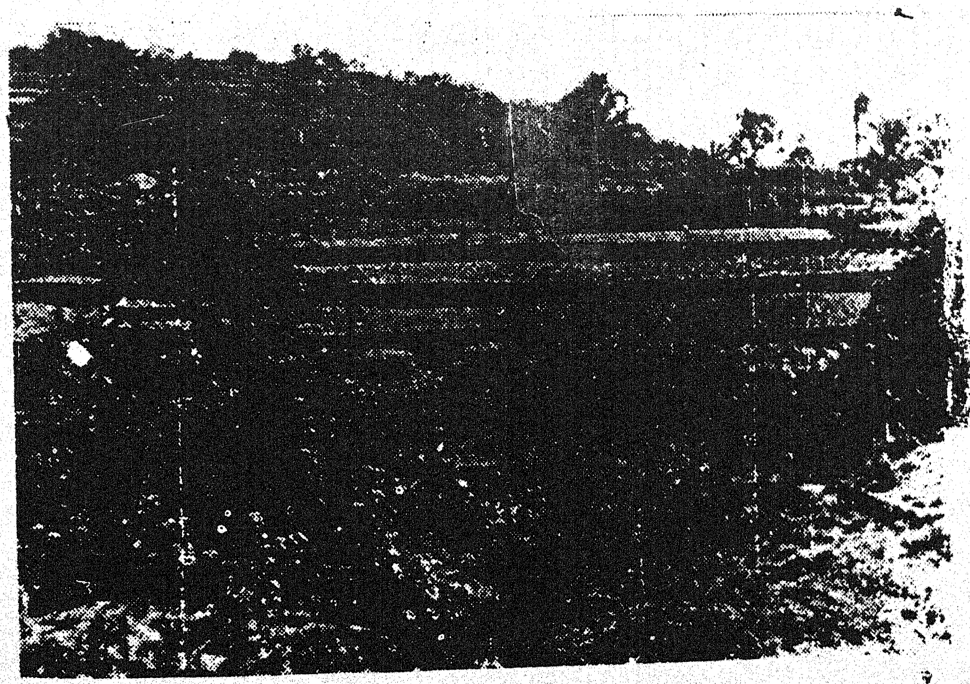
- Launched in 1980-81 to increase watershed retention capacity (for rainwater) by increasing infiltration, surface storage at extensive location, utilising rainwater on site, reduce erosion and consequent sediment hazard, and promote more crops and plant management.

- Presently in operation in 180 watersheds of 8 catchments spread over 7 States and Union Territory of Delhi.

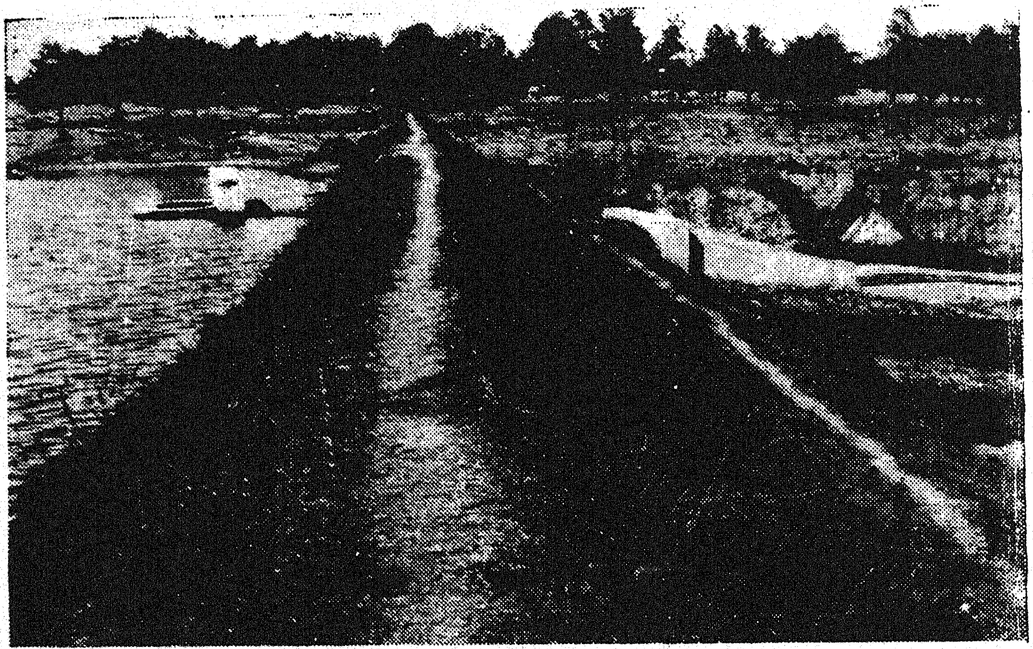
- Planned and implemented on the basis of priority watersheds for all types of land and associated drainage system.

- Monitored for physical and financial progress as well as reduced run off, silt load and catchment improvement.

TREATING LAND SURFACE ACCORDING TO SLOPE GROUP FOR CULTIVATION AND FOR RAISING VEGETATION.



INTEGRATED TREATMENT OF WATERSHED RAISING CASHEW, PUTTING UP WATER HARVESTING STRUCTURE AND CULTIVATING WITH SUPPLEMENTARY IRRIGATION.



- Till 1983-84 area treated 106430 ha. within priority watershed area of about 1,50,000 ha. at a cost of Rs. 181.0 million.

4. **CONTROL OF SHIFTING CULTIVATION**

- Launched during Fifth Five Year Plan in the North Eastern Region and States of Andhra Pradesh and Orissa.
- Continued in the Union Territories of Arunachal Pradesh and Mizoram during the Sixth Five Year Plan.
- Aims at providing each jhumia family 1 ha. of developed land for cultivation with irrigation preferably and one ha. for taking horticulture, commercial or plantation crops or forest trees.
- Till 1983-84 a total of 1700 family have been resettled on about 3400 ha. at a cost of Rs. 13.75 million.

5 **RESTORATION OF OLD FALLOWS**

- Programme was taken up in the Productivity Year 1982-83 in 8 States which accounted for 8 million ha. of the total of 9.55 million ha. for the country,

- During 1982-83 was in operation in 12 States.
- Aims at bringing old fallows to productive land management through cultivation, raising of fruit and utility trees, afforestation and developing grasslands with erosion control and moisture conservation works wherever needed.
- About 0.75 million hectares of such long fallows have been restored in 2 years.

COORDINATION

(a) National Land Use and Conservation Board. Some Union Secretaries, Technical and Scientific heads at the National level, representatives from 5 States, 6 non-official experts as members.

- To provide expert advice for framing policy direction for care %.and scientific management of land and soil.
- To coordinate work of State Land Use Boards.

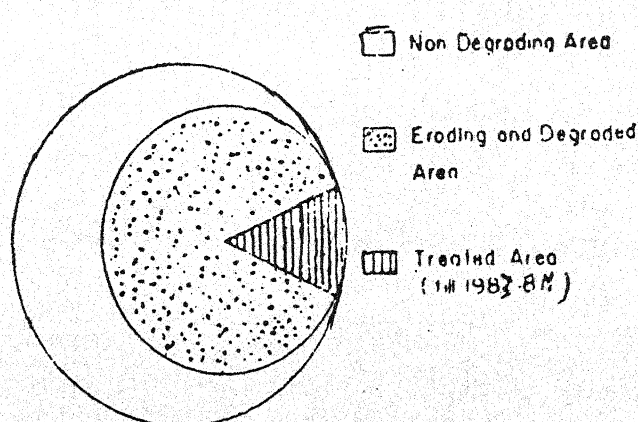
(b) State Land Use Boards-22 States and Union Territories have such board of alternative Body with Chief Minister as Chairman in most cases.

- To coordinate the activities of Line Departments concerned for rational development and utilisation of land and soil.

LEGISLATION

For effective implementation of Soil Conservation Programme, a model Bill on Soil Conservation was circulated in 1959, 1967 and 1974 : 14 States and 2 U.Ts. have brought such Acts in forced.

AREA UNDER EROSION AND DEGRADATION VIS-A-VIS TOTAL GEOGRAPHICAL AREA AND AREA TREATED



PROGRESS

Area treated till 1983-84 -27.97 million ha. at a cost of Rs. 10645 million.

BENEFITS

1. Production increase in crop yield-0.6 to 5.11 quintals per ha./year for millets, maize, paddy, groundnut and potato.

2. Increase in forest cover - 0.43 million ha. in States of Bihar, Himachal Pradesh, Meghalaya, Tamil Nadu and Chandigarh only

3. Additional area irrigated through water harvesting -0.04 million ha. in Bihar, Karnataka and Tamil Nadu only.

Protective/Restorative

(1) Area protected - 26.52 million ha.

(2) Siltation reduced in the Reservoirs -

	Initial SPR	Latest SPR
Bhakra	7.8	6.0
Maithon	15.0	12.0
Panchet	13.1	10.2
Hirakund	2.5	1.3
Machkund	2.9	2.1
Tawa	5.2	2.3

(3) Area restored to productive management waste lands -0.23 million ha. of gullied land, alkali soils in Bihar, Haryana, Karnataka, Punjab and Tamil Nadu only.

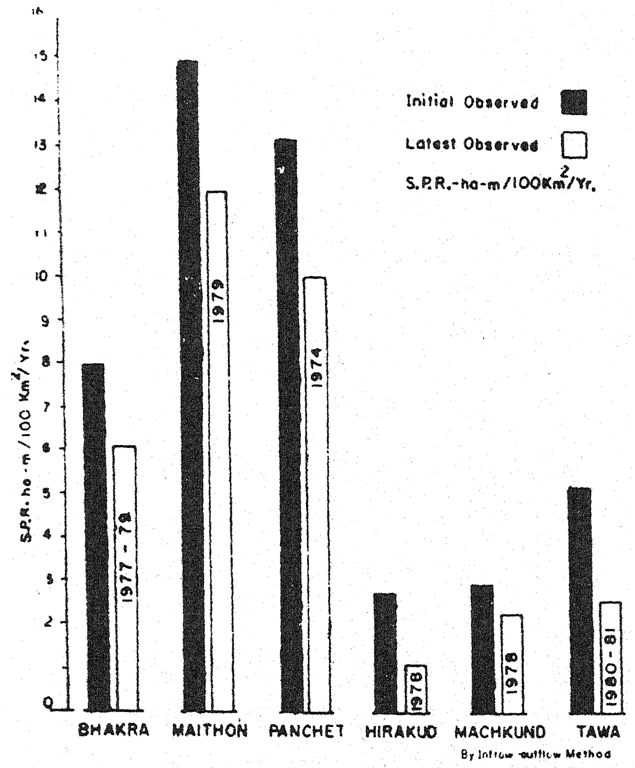
Area restored by raising utility plantation of Sisal (Agave sisalana) Cashew -0.53 million ha. of degraded and unproductive land restored in Bihar, Chandigarh, Himachal Pradesh, Meghalaya and Tamil Nadu only

EMPLOYMENT

Casual - upto 1982-83 - 244 million mandays in Bihar, Haryana, Himachal Pradesh, Karnataka and Tamil Nadu only

Regular - upto 1982-83 - 6445 man years in Bihar, Gujarat, Haryana Himachal Pradesh, Karnataka, Punjab and Rajasthan only.

Initial and Latest Sediment Production Rates (S.P.R) of some Catchments covered by Centrally Sponsored Scheme of Soil Conservation for River Valley Project.



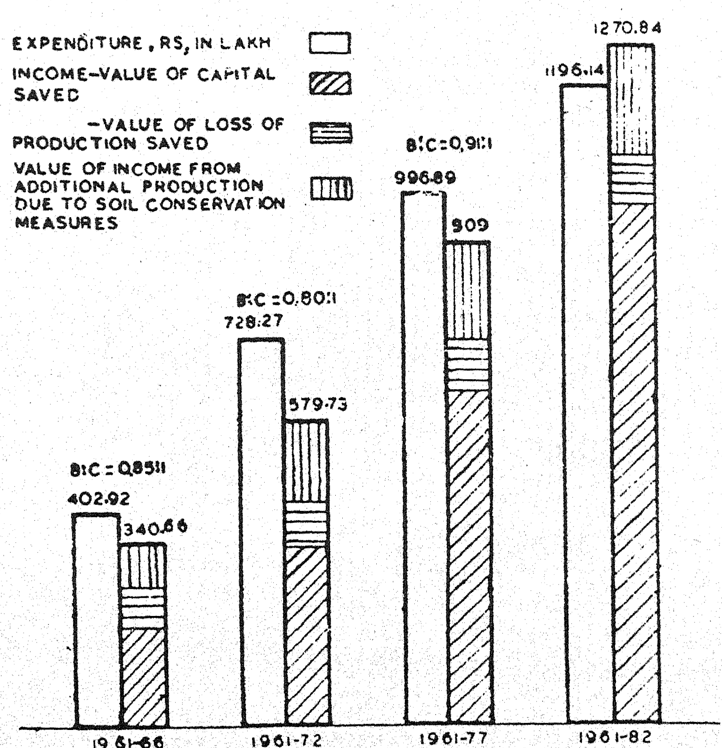


Fig.4 COST EFFECTIVENESS OF SOIL CONSERVATION MEASURES IN HIRAKUD CATCHMENT

Effectiveness Analyzed

(a) Whole of Hirakud catchment

Year	Expenditure	Income Value of Capital Saved	Loss of Production Saved	Value of Income from addl. production	B.C. Ratio
1961-66	402.92	204.36	68.15	68.15	.85
1961-72	728.27	348.15	87.38	144.20	.80
1961-77	996.89	348.15	101.00	200.00	.90
1961-82	1196.14	954.10	105.24	211.50	1.06

(b) A group of 16 erosion control-cum-water/harvesting structures in Hirakud catchment, Orissa.

Cost effectiveness of Small erosion control - Hirakund

Costs	Protective benefits	Productive benefits	Total benefits
12.274	14.583	13.899	28.482
B.C. Ratio	1.19	1.13	2.32

All values adjusted at 1971 level

COST EFFECTIVENESS OF SMALL EROSION CONTROL CUM-WATER HARVESTING STRUCTURES IN HIRAKUD CATCHMENT, ORISSA

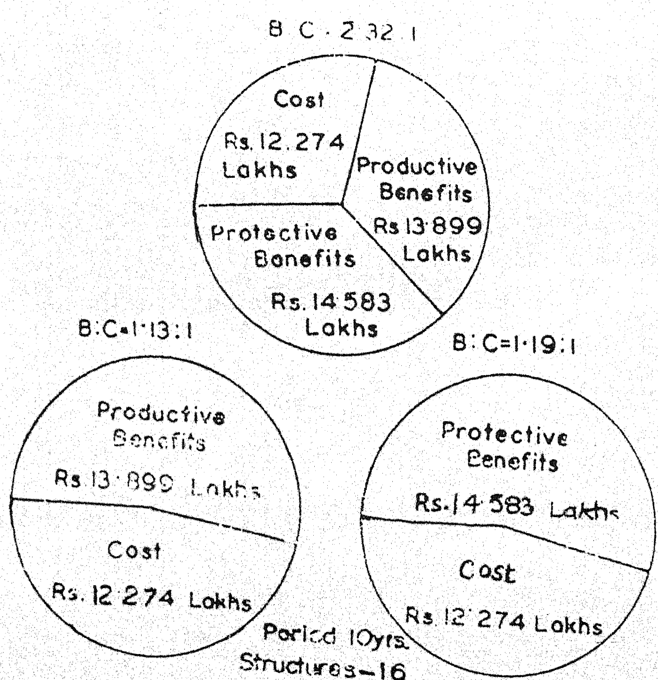


Fig 5

PROGRAMME OF NCDC IN SOYA PROCESSING

R.V. Gupta

NCDC has so far assisted five soy processing complexes with a total capacity of 2.7 lakh tonnes of soybeans per annum based on 300 working days in a year.

Of the five sanctioned units; three are in operation. These are Seoni-Malwa and Sehore in Madhya Pradesh and Haldwani in Uttar Pradesh.

NCDC as part of its promotional activity, prepares a detailed project report on the possibilities of agro processing of oilseeds on the basis of a preliminary survey report to identify the trends in production of the crop - past, present and projected, capacity installed and in operation, under implementation and planned and the surpluses available for creation of additional processing capacity in the relevant oilseed.

After assessing the potential, a detailed project report is prepared, which inter-alia includes:

* The cost estimates for the project covering cost of land and its development, buildings and civil works, plant and machinery, other fixed assets, pre-operative expenses and interest burden during construction period to be capitalised as also the margin money required for working capital.
* Break-even point of the complex.
* Income statement as also cash flows.
* Sensitivity analysis.
* Return on investment, internal and financial rate of return.

Sequel to the sanction of the project, NCDC assist the implementing cooperative in:

* Site selection.
* Design of lay-out.
* Selection of plant and machinery based on the most modern technology, cost effective options as also civil works.
* Preparation of schedule - PAR chart/PERT chart.
* Monitoring of the project through periodical meetings at site.

* Finalising organisational chart as also assist in recruitment of personnel for the complex.

- Un-like in the private sector, the NCDC units are designed on modern technology options. Besides, they are also designed towards ensuring a maximum mill member linkage. Further, NCDC assisted units are designed towards ensuring that the benefits of processing are ploughed back to the oilseed grower in relation to produce tendered by him for the plant. In addition, the oilseed producer is provided all the necessary inputs and advice on package of practices towards increasing his productivity. In all these respects, NCDC assisted units are different compared to a private sector processing unit.

SOYBEAN PROJECTS ASSISTED BY NATIONAL COOPERATIVE DEVELOPMENT CORPORATION

STATE/LOCATION		SOYBEAN CAPACITY -'000 tonnes/Yr	RS.IN MILLIONS	
			Block cost	NCDC share of assistance
ANDHRA PRADESH				
1.	Seoni-Malwa	60.0	127.0	102.4
2.	Sehore	60.0	128.9	104.5
3.	Chhindwara	60.0	247.0	197.6
UTTAR PRADESH				
4.	Haldwani	30.0	90.9	72.7
RAJASTHAN				
5.	Kota	60.0	220.0	176.0
	Total	270.0	813.8	653.2

FUTURE OF SOYBEAN CROP AND THE ROLE OF COOPERATIVES

- From the historic trends of the soybean production, one could assess that the future prospects for the crop in the country are bright. The crop would have a place in the oilseed economy of the country.

Increases in area under soybean are expected in the ensuing years on account of:

* Sizeable availability of fallow land available in Madhya Pradesh and eminently suited for raising the crop.
* Replacement of cotton by soybean in view of the self sufficiency already achieved in cotton and the lower order of priority placed on further augmentation of the cotton crop.

* Replacement of low economy crops as in the past; both in traditional as well as newer areas/states.

While it would be difficult to really forecast and project the future trends in soybean production, the promise seems to be bright.

It is expected that the cooperatives would take advantage of these surpluses in production and plan newer capacity in areas having the potential.

In planning the cooperative capacity, the mill member linkage as in the past would be ensured through the input of Cooperative Development and Input Services.

NUTRITIONAL QUALITY OF SOY MEAL

Properly processed soy meal contains no harmful factors.

Un-like groundnut and cottonseed meals, soy meal is devoid harmful aflatoxin.

Similarly un-like in cottonseed, soymeal is devoid of gossypol.

Soy meal contains higher levels of protein and energy than the other plant proteins.

High contents of lysine - an amino acid in soy meal, makes it unique among plant proteins. This high level of lysine is especially important in the nutrition of young poultry.

In view of the high protein and energy levels, soy meal offers huge possibilities for human consumption. Some of product possibilities from soybean/soy flour are:

a. ediblesoy flour for incorporation in other preparations or for fortification;

b. Texturised soy products;

c. Soy milk;

d. Tofu;

e. Tempeh;

f. Protein isolates[1];

g. Protein concentrates[2];

h. Weaning foods, etc.;

i. Spun products and meat extenders.

PROTEIN CONTENTS OF VARIOUS LEGUMES, CEREALS AND OTHER FOOD PRODUCTS

Crop/ Food product	Percent protein by weight
Legumes	
Soybean	38
Lima bean	25
Cowpea	25
Peanut	26
Winged bean	31
Chickpea	20
Mungbean	24
Cereals	
Rice	7.5
Wheat	11.9
Maize	9.5
Sorghum	10.1
Food products	
Cheese	30
Fish	22
Chicken	21
Beef (steak)	20
Eggs	13
Milk (whole)	3

1. In the commercial trade, it is accepted that soy protein concentrates contain no less than 70 percent protein (N x 6.25) and isolates contain no less than 90 percent protein (N x 6.25) on a dry or moisture free basis.

2. Same as above.

ANNEXURE-1

AMINO ACID CONTENTS OF SOME AGRO BASED AND LIVESTOCK PRODUCTS IN HG/G OF N

Amino acid	Groud-nut	Mus-tard	Cotton-seed	Sesame	Soy-bean	Gaff-flower	Sun flower	Niger	Coco-nut	Milk Protein	Meat	Maize
Isoleucine	411	520	380	418	538	397	470	400	450	651	327	289
Loucine	608	610	590	738	771	613	640	608	670	1002	512	810
Lysine	357	690	430	256	632	284	320	368	379	794	546	180
Methionine	88	160	140	280	·134	162	164	144	176	250	155	116
Cystine	150	150	160	218	178	170	171	160	155	91	79	81
Phenylalanine	506	650	520	640	494	432	450	480	434	494	257	284
Tyrosine	358	260	-	412	318	248	238	-	253	520	212	382
Threonine	269	340	350	310	394	310	336	336	322	470	276	249
Tryptophan	110	160	120	146	138	-	126	-	88	144	73	38
Valine	498	620	490	390	525	546	499	512	530	701	347	319

TRENDS IN AREA, PRODUCTION AND PRODUCTIVITY OF SOYBEANS IN INDIA SINCE 1972-73

Year	Area	Production	Productivity
1972-73	0.34	0.28	819
1973-74	0.48	0.39	829
1974-75	0.67	0.51	768
1975-76	0.93	0.91	975
1976-77	1.25	1.23	988
1977-78	1.95	1.83	940
1978-79	3.06	2.93	975
1979-80	4.96	2.82	569
1980-81	6.08	4.42	728
1981-82	6.22	4.67	750
1982-83	7.68	4.91	639
1983-84	8.14	5.83	716
1984-85	12.43	9.55	768
1985-86	13.01	9.82	754

Area - Lakh Hectares
Production - Lakh tonnes
productivity - kg. per Hectare

STATEWISE PRODUCTION OF SOYBEAN IN INDIA
FOR THE YEARS 1978-79 TO 1985-86

(Thousand tonnes)

STATE	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86
1. Gujarat	-	-	-	8.0	4.5	4.5	4.5	4.5
2. Madhya Pradesh	232.0	244.8	350.0	350.0	358.6	440.3	769.6	783.1
3. Rajasthan	-	-	5.2	11.0	6.5	15.6	26.1	31.8
4. Sikkim	-	-	-	-	-	3.9	4.3	5.3
5. Uttar Pradesh	60.3	36.1	81.0	97.4	117.4	117.4	148.0	155.0
6. Others	1.1	1.1	6.0	0.6	3.9	1.3	2.3	2.2
7. All India	293.4	282.0	442.2	467.0	490.9	583.0	954.8	981.9

SUPPORT PRICES OF SOYBEAN AS ANNOUNCED BY GOVERNMENT OF INDIA

Year	Rupees per quintal for FAQ	
	Black	Yellow
1977-78	145	
1978-79	175	
1979-80	175	
1980-81	183	198
1981-82	210	230
1982-83	220	245
1983-84	230	255
1984-85	240	265
1985-86	250	275
1986-87	255	290
1987-88	260	300

FLOW DIAGRAM OF SOYA PROCESSING

```
                         OILSEEDS SOCIETIES
                                :
                                :
                            Soya Beans
                            :        :
                         Godowns    Seed Cleaner
                            :        :
                            :       Silos
                            :        :
                            ----------
                                :
                           SEED CLEANER  )
                                :        )-- REFRACTION (2.0%)
                                :        )
                             DESTONER    )
                                :
                           TEMPERING BIN
                                :
                           SEED CRACKER
                                :             AIR
                         VIBRATING SCREEN ----------- HULLS ---- CYCLONE
                                :          ASPIRATOR (8.0 per cent) |
                                :                                   :
                           CONDITIONER                         HULLTOASTER
                                :                                   :
                                :                                   :
                              FLAKER                          HAMMER HILL
                                :                                   :
                                :                                   :
                          SOLVENT PLANT                             :
                                :                                   :
                                :                                   :
   ---------------------------------------------------          HULL SILO
   :                                                  :             :
CRUDE SOYA OIL (18.0 %)                             MEAL(72.0 Per cent)
   :                                                  :             :
STEAM HEATER                                       TOASTER          :
   :                                                  :             :
REAGENT MIXER                             GRADER COARSE MEAL        :
   :                                                  :             :
CENTRIFUGE                                     HAMMER HILL          :
   :  GUMS                                            :             :
DEGUMMED OIL RECEIVER                            MEAL SILO          :
   :                                                  :             :
VACUUM DRIER                                     BLENDER-------:
   :                                                  :
TO STORAGE/REFINERY/DISPOSAL                       BAGGING
   :                                                  :
                                                  STITCHING
                                                      :
                                             GODOWN/DISPOSAL
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PROCESSING OF SOYBEAN SEEDS

Soybean which is stored in the silos/godown is brought by conveyor to a seed cleaner to remove sticks, big stones, foreign materials etc. Seeds are then fed to destoner to remove small stones. Clean beans are then fed to a hot-air drier where beans are dried at around 75^0c. to a moisture level of 9.0%. Dried beans are then cooled and stored in tempering bins to loosen the hulls on seeds. After tempering, seeds are subjected to cracking, where seeds & hulls are separated. Hulls are then removed by aspiration. After cracking & dehulling operation, soybean meats are subjected to "Conditioning", where live steam is fed at a temperature of around 60^0-65^0c. and to raise the moisture content to about 11 percent - Conditioned beans are then passed through a hydraulic flaking mill, where conditioned meats are converted into flakes of thickness of 0.25 - 0.3 mm.

The flakes are then sent to a continuous extractor, in solvent extractions plant through conveyor whereby using normal in-Hexane, oil is extracted. The oil present in the flakes gets dissolved in the solvent and forms a mixture of solvent and oil, called "miscella" which is then passed through a series of distillation operations to separate oil and the solvent in the most optimum manner.

The meal with left-over solvent (around 30 percent) is carried over to either a Desolveniser Toaster (DT) or steam drying tubes. In either case, the solvent is evaporated from the meal by using high temperature (110^0C) and a little vacuum. During the process of evaporation of solvent, live steam is injected to the meal which ensures retention of moisture in the meal to optimal limits. The meal after desolventisation is dried/toasted. The evaporated solvent is taken off to the condenser through a vapour scrubber where solvent vapours are washed so as to trap the fines. The desolventised and dried/toasted meal is then taken to the finishing section where it is cooled in a multistage cooler. Here the meal is retained for sometime in each stage, agitated and hot air pulled out with the help of blower through a cyclone and dust collector. The cooled meal is then ready for bagging.

The Crude oil from solvent extraction plant is sent to Storage for subsequent sell into market for manufacture of Vanaspati. Crude Soy oil contains about 2 to 3 percent gums which is a source of Lecithin. Thus a plant may comprise of a degumming section to remove gums & Lecithin plant for the manufacture of lecithin from gums. The process of manufacture of lecithin involves, evaporation of moisture from Hydrated gums and cooling the resultant lecithin. Degummed oil may be sent to vegetable oil refinery, where free fatty acid content (1.5 to 2%) of oil is removed using caustic lye, bleached in bleacher to reduce colours & de-odorised to remove undesirable flavour. The refined oil is then sold to consumers after packing in consumer packs.

The extracted meal is used for two purposes, depending upon the type of pre-processing steps taken in processing of soy seeds. In case the extracted meal is required for use as feed for live stock, hulls content can go up to 5 to 6 percent & thus hull separation step is not critical. Also, separation of damaged seeds etc. may not be necessary. However, Ureas activity is controlled to a maximum of 0.2, controlling heating parameter in toaster. If the extracted meal is required for human consumption, damaged seeds, stone etc. are separated, hulls are removed using hull removal system to a maximum & the extracted meal is fed to dryer instead of toaster to remove solvent, where PDI is also maintained. The extracted meal prepared for human consumption is used for manufacture of value added down stream products such as edible flour, Texturised Soy Proteins (TSP), Protein concentrate and isolates. Soy flour is manufactured from soy extraction, in flour mill and is used for fortification of wheat flour as also of bread. TSP is manufactured by passing the soy flour through extrudes where a number of parameters like steam, heat etc. are controlled.

DOWN STREAM PRODUCT POSSIBILITIES FROM SOY MEAL

Some of the product possibilities from soybean/soy flour are:

a. edible soy flour for incorporation in other preparations or for fortification;

b. Texturised soy products;

c. Soy milk;

d. Tofu;

e. Tempeh;

f. Protein isolates[3];

g. Protein concentrates[4];

h. Weaning foods, etc.;

i. Spun products and meat extenders.

Soy-protein used as ingredients in a wide variety of foods in the United States and other countries, are primarily based on edible soy

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3. In the commercial trade, it is accepted that soy protein concentrates contain no less than 70 percent protein (N x 6.25) and isolates contain no less than 90 percent protein (N x 6.25) on a dry or moisture free basis.

4. Same as above.

flour and centered around products such as Texturised Soy protein, soy milk, protein isolates and concentrates meat extenders, milk extenders, weaning foods etc. In countries such as China, Japan, etc. soy beans are used traditionally for manufacture of:

a. <u>fermented foods</u> - Under this category come soy sauce, miso, natto, sufu, tempah;

b. <u>non-fermented foods</u> - Under this category come soy milk, tofu and derived products, yuha, kinako, moyashi, etc.

PRODUCT POSSIBILITIES IN THE INDIAN CONTEXT OF SITUATIONS

While the above product possibilities exist, the Indian context of situations as obtaining at present, permit the following product possibilities:

a. edible flour;

b. texturised soy products;

c. soy milk;

d. tofu

The stage, however, is not set for the other products as such.

NUTRITIONAL QUALITY - SOYBEAN OIL

- Soybean oil has high levels of Poly-Unsaturated fatty acids - also called pufa

- Research in human has shown that blood cholesterol levels can be reduced by decreasing total fat intake and substituting pufa for saturated ones

- Pufa cannot be produced or synthesized by human body. Pufa is necessary for growth and reproduction and protects against excessive 10 a water of damage from radiation. Hence Pufa especially linoleic acid must be obtained from food. Soy-oil is rich in linoleic acid as well.

FATTY ACID COMPOSITION OF SOME EDIBLE OILS AND ITS IMPACT ON CHOLESTEROL LEVELS

Edible		Percent to total Saturated	Oleic Etc.	Pufa	Percent lowering of Cholesterol level*
1.	Safflower	10	12	78	(16)
2.	Sunflower	10	28	62	(12)
3.	Cottonseed	16	26	58	0
4.	Soybean	17	28	55	3
5.	Sesame	13	41	46	2
6.	Corn	16	41	43	(15)
7.	Rice-bran	20	44	36	(17)
8.	Rapeseed	16	58	26	0
9.	Peanut	18	48	34	10
10.	Coconut	87	10	3	30
11.	Palm	52	39	9	20
12.	Palm Kernel	83	13	4	30

* Figures in bracket indicate negative.

POLICY ISSUES RELATED TO IRRIGATION PROJECTS

SH.M.A.CHITALE[1]

A number of issues are involved in the formulation of policy related to Irrigation Projects. In fact these are closely related to the National Water Policy itself since more than 85% of the waters in the ultimate stage will be used by irrigation projects. The more important issues which will be covered during the address are listed below:

1. PLANNING OF IRRIGATION PROJECTS

The dependability of flows for irrigation projects is important. Projects can be planned for 50% dependability of 75% dependability or for any intermediate dependability depending upon the local needs and the degree of rainfall which the area receives.

2. CONCEPT OF BASIN MANAGEMENT

So far irrigation projects have been planned, investigated and implemented more or less on individualistic basis. Since basin is generally accepted as a unit for development of water resources, certain very important issues are involved in the basin management itself like inter-se priorities of projects, needs of area, implementation of future schemes and above all the integrated operation of several reservoirs in the basin itself.

3. BALANCED EXPLOITATION OF GROUND WATER

So far, development of surface and ground water has developed more or less on a lateral basis. In otherwords balanced exploitation of conjunctive use of surface and ground water has not developed in the manner in which one would like to have. Several Policy Issues are involved in this including levy of Water Rates, Subsidies and tariff chargeable for power.

4. DROUGHT MANAGEMENT

In the recent times drought management has assumed great significance and in fact has to be managed with the floods as well. The National Water Policy under formulation is expected to cover this aspect adequately.

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1. **Chairman, Central Water Commission.**

5. ISSUES ARISING OUT OF CLASSIFICATION OF IRRIGATION PROJECTS

At present Irrigation Projects are classified into three categories - Major, Medium and Minor. Conflicting view points have been expressed by certain quarters in regard to the Inter-se priority of such projects. Policy issues relate to the judicious mix of all the categories of Irrigation Projects for optimising the benefits.

6. WATER RATES

The economic viability of Irrigation Projects depends largely on the revenue realised by way of classification of Irrigation Water Rates. Broadly speaking these Water Rates are so low that they do not meet even the working expenses. The matter is under discussion with the States to enable upward revision.

7. ECONOMIC VIABILITY

At present the criteria of B.C. Ratio is applied in adjudging the viability of Irrigation Projects. Since this criteria has certain inherent limitations, the issues involved in switching over to other concepts such as internal rate of return etc. are being examined.

8. MANAGEMENT OF IRRIGATION SUPPLIES

Management of Irrigation supplies and Training of personnel and farmers has assumed great importance in the recent times to consolidate the gains from huge investment made in Irrigation Projects. Policies involved in this are in regard to the inter-disciplinary approach, extent of farmers' participation and related matters.

WATER MANAGEMENT IN DROUGHT PRONE AREAS

M.A. CHITALE[1]

KEYWORDS

Drought; drought resistance; water shortage; moisture deficit; water resources development; water management; conjunctive use; evaporation control; irrigation planning; mulching; water reuse; effluent reuse; administrative preparedness; contingency plans.

INTRODUCTION

India has a geographical area of 3.29 million km an average annual precipitation of 1000 mm. Most of the country receives rainfall during the monsoon months of June to October. The amount of rainfall is highly variable in space and time - particularly in the 1/3rd part of the country which receives an annual rainfall of less than 750 mm. The Central Water Commission of Government of India has carried out a detailed analysis of the 99 drought affected districts in India which cover an area of 1.08 million km. This paper deals with issues connected with water management of the drought prone areas in India with particular reference to the southern part called the Deccan plateau which constitutes about 50% of the drought-prone area.

In the water year 1985-86 (Reckoned from June to May of the following year) the drought-prone areas in India suffered heavily. Many sub-divisions faced a rainfall deficit consecutively for four years and during 1985-86, the deficit was even more than 30%. The water year 1972-73 had also experienced a severe drought over a large part of India, followed by another deficit year in 1973-74. Every drought year has its unique features such as precipitation pattern, conditions in the preceding and succeeding years and conditions in the neighbouring areas. The lessons learnt out of these situations can be of great help in minimising hardships in future. Some such lessons have been outlined in this paper.

DISTINCTIVENESS OF THE REQUIREMENTS

While considering the strategies of drought management, it is necessary to distinguish between the different situations of water shortage. The problems of the arid areas, where one good crop is not

1. Chairman, Central Water Commission and ex-officio Secretary to the Government of India New Delhi, India.

possible even in the normal years, are quite different from the ones of those areas, where one good crop is normally expected, but because of a large variability in the rainfall, this crop is frequently lost under conditions of scanty precipitation. Areas of the latter type are the drought-prone areas as distinct from the arid or desert areas.

Even the normal high-rainfall areas may occasionally face a failure of rains and consequent upsetting of the normal human and economic activities. Relief measures are required to be pressed into service under such a situation to tide over the temporary difficulties caused. Where such occurrences are infrequent, say less than once in 10 years, port-term relief measures prove to be adequate and a separate comprehensive long-term strategies are called for.

But where the normal rainfall is limited to about 750 mm to 800 mm in a year and the variability is also very high, i.e., above 30% as in the case of the Deccan plateau, the life supporting hydrologic system is always in a delicate balance. In these areas all the hydrologic entities like the surface river flows, reservoir storages, soil-moisture or groundwater get seriously affected frequently, throwing out of gear the various activities woven around them. Hence, a more comprehensive and long term attention is required to such areas for establishing a stronger and stabler economic base.

VARIABILITY OF THE HYDROLOGIC PROGRESS

The nature of disturbance caused by the variations in the precipitation pattern in the drought-prone areas is not the same in different years. It manifests itself in different years in different degrees in respect of soil=moisture deficits, ground-water decline, reduced river flows or less of storage in the reservoirs. In some years good amount of total annual precipitation is received in a few intensive storms with the result that the reservoirs get filled up by the flash floods, but the agricultural soils do not receive their posture replenishment on a continuous basis over the crop season. Under such a situation the crops from the unirrigated lands stand considerably effected. On the other hand, there are some years in which the well spread out thin showers replenish the soil-moisture periodically throughout the agricultural season, thereby giving rise to excellent crops, while over-land run-off is very poor, river flows very low and the reservoirs left empty or only partially filled. All the activities dependent on the waters from reservoirs or from the river flows suffer in such years. Under the conditions of a thinly spread out precipitation, the evaporation losses from the land surface are also very high. When the surface soil does not experience saturation conditions, recharge of the ground-water is poor. Thus, while the normal rainfed cultivation is in good shape, those who are dependent on replenishment of ground-water or on reservoir storages either for drinking water or for crop cultivation badly suffer.

Hence for understanding the real significance of a drought situation, it is not proper to go by the variability in the total amount of rainfall alone, but it is necessary to analyse and understand the variability in the total hydrologic process in the area. Management of a drought-prone area really revolves around the management of the variable manifestations of water in the form of soil-moisture, ground-water or surface flows.

IMPACT OF THE SOIL COVER

On the Deccan plateau, a very large part of the drought prone region has a cover of clayer soil-locally known as the 'black cotton soil' which is highly moisture retentive. It has high proportions of organic matter, calcium & magnesium carbonates, iron and alumina. It holds up to 300 mm of fee water per meter depth as compared to only 100 mm in sandy Ioam. An excellent crop of cotton or groundnut can be grown on these soils even with a limited precipitation of about 500 mm during the three months of the rainy season if it is reasonably well spread out. A good crop of sorghum is possible with just 400 mm of precipitation. But for the presence of these soils, the impact of a drought situation on the agricultural produce from the Deccan plateau could have been much more severe. However, this is also a mixed blessing. Because these soils are highly impervious and do not permit liberal percolation and recharge of the ground-water, these areas witness an apparently paradoxical scenario of good agricultural crop but acute scarcity of drinking water. Particularly, the villagers that depend on ground-water for their domestic supplies are badly hit.

USE OF GROUND-WATER

With the advent of machine power, man's capacity for ground-water extraction has increased manifold. The annual extraction has now exceeded the limits of annual recharge at many places. Deep aquifers in hard-rock areas which are not properly linked with a natural or artificial recharge system have been found to be not dependable.

Ground-water is not an independent entity but is only one of the phases in which water exists in its overall hydrologic cycle. There are, therefore, obvious limitations to the extent its use can be stretched. Deep drilling may only help to mine the water accumulated over centuries, such mining efforts cannot provide a long-term sustainable support for development. The mechanism of recharging of ground-water is not yet fully known for many areas. Extensive research in this field is one of the prime needs of the drought-prone regions.

PERCOLATION TANKS

A large number of percolation tanks have been constructed in the drought-prone part of the Deccan plateau. But the area of influence of each tank appears to be limited to about 2 km only. Recharge of ground water, however, can take place to the extent of about 60% of the tank capacity. Improved measures for spreading the recharge effect on an extensive area will have to be evolved through experimentation. A cluster of such percolation tanks could be of considerable help in development of ground-water sanctuaries.

MANAGEMENT OF AGRICULTURE

Since the largest demand for water is from the Agricultural Sector, greater attention is needed to ensure water for establishing the agricultural out-put. Effects of short drought periods can be over come by adopting correct agronomical practices like deep tillage, dead furrow and mulching which improve the availability of soil-moisture.

The year's choice of crops depends upon the commencement of the rainy season-an early start or a late start. This can vary by as much as 30 days. Hence alternative seed packages have to be kept ready as a measure of contingency plan. One of the effective ways of reducing the impact of variability in the precipitation process is to have a system of intermixed cropping. The agriculturist who is supporting himself from dry-land farming will always be better off over a series of years by growing a mix of 2 or 3 crop varieties simultaneously, each having a different period of growth and germination. Short duration crops like grams, mustard and pulses can be very well intermixed with others like sorghum and wheat.

It will be desirable to provide a stronger scientific base to such practices because there are natural limitations on the irrigation facilities that can be provided to the drought-prone areas. In the Deccan plateau, more than 60% of the drought-prone region will have to depend on the dry-land farming practices only, even after developing the water resources of this area fully. The crops that are very sensitive to the moisture stress should not be encouraged in the drought areas.

Water is required by the crops more at their critical stages of growth. Water stress during other periods has negligible impact on yields. In the case of dwarf wheat, even after reducing the number of waterings from six to three, the yield level is 70% of the optimum of 5 tonnes/ha. It is clear that additional waterings do not add proportionately more to the yield. The position is more favourable in the case of lentils, grams, linseed, sunflower, mustard or safflower. Reducing the waterings from 4 to 2 in Rabi has hardly any effect on the optimum yield levels of lentil (2.0 t/ha.) gram (2.65 t/ha.) or safflower (2.2 t/ha.). For instance with just one watering of 80mm for

Rabi (winter) gram at Delhi the yield obtainable is of the order of 2.3 t/ha. against an optimum of 2.65 t/ha. These crops should therefore, be preferred for irrigation in the drought-prone areas. Even under the rainfed conditions millets, barley, pulses possess intrinsically higher tolerance for rainfall deficiency compared to high yielding varieties of wheat and paddy and should, therefore, be preferred.

MAXIMISATION OF RETURNS

In every human or economic activity, there is a certain capacity to absorb and tolerate the deficits in the supply. For a proper management plan, the 'deficit-tolerance-capacity' of the different activities will have to be properly quantified and the activities permitting greater tolerance of deficits will have to be preferred. Rather than providing the theoretically needed six application of water, the crops can still flourish well with only four applications for the winter crop and may reasonably survive, if not flourish, with only two applications also. The net gains to society by adopting such a curtailed and rationed supply for all the farmers are far greater than those obtained by meeting the full needs of a limited few. The management strategy has to ensure the fulfillment of this objective.

For maximising the economic returns from the limited available water resources, it is more advantageous to encourage the low water consuming crops like sorghum (Jowar), maize and oilseeds (sunflower, groundnut), pulses (moong) and vegetables (chillies, potatoes and onions). It has been shown that net returns per unit of water in growing the above mentioned crops are 150%, 200%, 210%, 250% and 400% respectively, of these obtained by growing paddy or sugarcane. Irrigation systems in the drought-prone areas will have, therefore, to support such low water consuming crops in preference to the high water consuming crops.

ADJUSTMENTS IN SANCTIONS OF WATER

In India, the trend of reservoir filling or the ground-water position for a water year gets fairly known by middle of August. Re-adjustments of sanctions and releases have to be carefully carried out by this time keeping a close watch on the behaviour of the monsoon. The modern management techniques using probability analysis have a great role to play in helping the system managers for dealing with the situations of "supply-variability" in the drought areas.

The crop varieties like Adsali sugarcane (one and a half year crop) for which large quantity of water gets unduly committed in advance because of its plantation during the monsoon period itself, will have to be replaced by the Suru varieties, in case sugarcane crop can at all be accommodated on the support from ground-water, because the plantation of

Suru variety can be regulated after the monsoon period according to the availability of water in the storages or in the ground-water reservoirs.

DRINKING WATER

On the drinking water side, however, relatively less flexibility exists. While the water supply required for cleaning purposes could be somewhat adjusted, the requirement for human consumption or for cattle population is an inflexible quantity. In the management of supplies such inflexible requirements will have to be met with as the first charge. Even though the cities' water supply projects, when conceived, aim at the Indian national standard of 200 LPCPD, because of the lag in the implementation of the projects on the one hand and the rapid expansion of the cities on the other, the actual supplies are seldom above 150 LPCPD even in the normal years. It is difficult to scale down the supply below 60 LPCPD during the severest drought period.

Rural community suffers most under the drought conditions for want of employment and for want of water. A dependable water supply system ensuring at least 40 LPCPD in the difficult periods is of almost importance for these areas. Absence of dependable arrangements for supply of drinking water tend to aggravate the migration to cities and hence the need for a greater priority to the rural water supply schemes.

WATER QUALITY

Ensuring high quality of water is difficult, particularly in the rainfall deficit years - when the streams lose their natural cleansing potential. There have obviously to be very stringent limits on the quality of effluent that can be let in to the natural streams. Otherwise a drought can result in to an epidemic. As for the ground-water, there is generally an increasing trend towards accumulation of salts in nature. In fact, some saline tracts already exist in drought-prone ares. To avoid accentuation of the salinity conditions, on one hand use of chemical fertilizers and pesticides on the lands in the drought-prone areas will have to be very severely restricted, and on the other hand recharge of the ground-water with fresh saline free water encouraged.

PREVENTION OF EVAPORATION

Faced with the limited availability of water, all possible efforts are necessary to prevent losses by evaporation from the irrigated farms as well as from the reservoir surfaces. Irrigated area is 5 to 10 times larger than the surface area of the reservoir. Moreover, when irrigation water is applied to parched and heated land surfaces or to open and porous soil crusts, evaporation loss is particularly very high. In the aggregate; evaporation losses from irrigated areas are much

greater than those from the reservoir surface. While the irrigation systems like drip irrigation can certainly eliminate a substantial part of the evaporation losses from the farms and reduce the water requirement for irrigation by 50%, they may not be viable on a large scale for some more years, being technologically very complex and highly capital-intensive. Under Indian conditions, costs of drip irrigation systems have been estimated around Rs.20,000/ha with additional annual operational costs at Rs.2000/ha. While efforts to develop locally suited cheaper drip techniques should continue, greater attention will have to be paid to the measures for reducing the evaporation from the surfaces of the irrigated farms by developing and popularising appropriate mulching practices and modifying the water application techniques.

It is observed that in the drought-prone areas the daily rate of evaporation increases sharply from March onwards reaching a peak rate of 13 mm/day in May which is more than double the average evaporation rate up to February. In the three months from March to May, more than 1000 mm of water evaporates from the reservoir surface. To avoid large losses of water in these three months, instructions have already been laid down by some of the reservoir operating authorities that the reservoir should be depleted to the minimum possible levels latest by end of February, thereby shrinking the reservoir surface. It has also been advocated that the surface irrigation systems in drought-prone areas should support only two seasonal crops between the period July to February (i.e., Kharif & Rabi seasons). Requirements of irrigation for the hot weather months - if any - are to be met from ground water only. Many States have already adopted this pattern in their new irrigation works.

CONVEYANCE LOSSES

Losses in water conveyance are also high during the dry summer months. Hence from the point of water conservation, it is not at all economical to run a canal system in the drought areas during the hot dry months. A better practice is to transport as much water as possible during the wet monsoon months or latest during the winter period thereafter and to store it in small ponds and tanks near the points of consumption for later use, during the summer months. An Irrigation system in a drought-prone area should accordingly, consist of a main reservoir, the conveyance and distribution net work, and a large number of tanks and ponds scattered through-out the command area, to be fed from the conveyance system. The irrigation as well as the drinking water supplies should best be tagged on to these local tanks and ponds, rather than direct to the main conveyance system which should necessarily be closed by the end of the winter season and well before the commencement of the summer season to avoid losses.

What applies to the canal system, equally applies to the releases into the river channel. It is not correct to release water in the river channel for transport over a long distance during the dry months. Even when this has to be resorted to, continuous low flows over long periods

should be avoided. It is better to rush the required quantity of water in a small period and then hold it up in small storages behind the barrages near the points of consumption. Such rush systems are being successfully practiced in the State of Maharashtra for managing supplies to the series of barrages in the Krishna-Warna-Panchaganga valleys from the upstream storages. The rush releases are made once in 2 to 4 weeks depending upon the distance for transport and the storage capacities behind the barrages.

CHEMICAL RETARDANTS

It would be desirable to hold water for the summer period in small size tanks, because the water held in the small tanks and ponds has been found to be somewhat amenable to treatment by spraying chemicals like fatty alcohols on the water surface. Water surface of the large reservoirs cannot retain the monomolecular chemical film on account of the waves generated by the winds on such surface. In Maharashtra, experimental use of such sprays has established a reduction of 30% to 50% in the evaporation losses. The chemicals are, however, costly, adoption of chemical sprays will depend on the nature of the use of the water from the tank. Water conserved by use of chemical sprays is a costly one (Rs. 5 to 10 perm of water saved) and will have to be earmarked for high value purposes only. Such measures could still be cheaper than the long distance transport of water by rail or road which is required to be resorted to for the survival of the population under extreme distress.

MULCHING

Mulching techniques have particularly a great role to play not only on the dry-land farms but also on the irrigated farms, because the moisture losses are very heavy in the dry climate of the drought affected areas. For various reasons, mulching has not received as much attention as it should have from the farmers. Mulches of straw, organic compost, coir waste, gravel, plastic sheets or chemicals and petroleum products have been tried on the research farms. It has been seen that introduction of scientific mulching practices on the agricultural farms in the drought areas can improve the retention of moisture in the farm soil by as much as 50% and improve the yields by 75%.

REUSE OF WATER

One way to improve the availability of water in the drought prone areas is to plan extensively for the reuse of water. All the domestic and industrial supplies can return to the system suffering just to 10% diminution. The return flows need to be properly channelized and mobilized. The sewerage from the cities is an important source of additional water. The sewerage system of a part of the Pune city in Maharshtra has been linked with the Khadakwasala irrigation system near

Pune effectively, where on an average 30 million litres per day of sewerage water, after removing the solid impurities, is mixed with the canal water in the proportion of about 1 : 1 and then use for irrigation. Delhi also has plans for utilising 800 million litres of its daily sewerage water for irrigating 9000 ha. of the semi-arid area around it.

DEPENDABILITY OF THE SOURCE OF WATER

The success of drought-proofing measures will very much depend upon the reliability of the source of water which can be harnessed for the development of the drought areas. Snowfed rivers from Himalayas have been able to provide a relatively more stable supply of water throughout the year for many irrigation systems in the north. Southern regions of India do not have that advantage. Even then the high rainfall catchments in the Sahyadri range near the west coast can provide a reasonably dependable source for the rain shadow areas on its cast. Where the catchments of rivers lie in the drought prone areas, the storages on the rivers are highly vulnerable to monsoon's variability. Smaller the size of the catchment greater the risk of failure of the storage. Hence large size storages should be preferred on these rivers - rather than a large number of small storages on the tributaries. Small tanks are particularly vulnerable to the droughts. For increasing the net availability of water in the drought-prone basins and for providing a more reliable supply proposals for inter-basin transfer of water from water-surplus basins to water-deficit basins have been under examination. A specialised agency of the Government of India - namely, National Water Development Agency - is pursuing these studies. Drought prone areas will get some relief, when some of these proposals materialise.

Normally, dug-wells have been found to be immune to the short drought periods, but cannot provide any insurance against successive droughts. Relatively, deep tube wells can with-stand successive droughts quite well. The Deccan plateau being a predominantly hard rock area, there is unfortunately little scope for such wells. It is however advantageous to combine the dug-wells with the deep bores.

PROTECTION AGAINST VARIATIONS

In Deccan, apart from the net deficit (20%) in the annual precipitation, the drought conditions are also caused by the three types of aberrations in the precipitation pattern namely, (a) late start of monsoon; (b) long dry spells during the monsoon period; (c) early withdrawal of monsoon. Situations of late start have been found to be more frequent than those of early withdrawals. Industrial and Drinking Water supplies are most vulnerable to the conditions of late commencement of monsoon. Hence it is always prudent to reserve some storage in the water supply reservoir for the requirements of the month of June and half of July, from whatever limited quantity is at hand.

Agricultural cropping programmes suffer under any of these three aberrations. But under all these conditions ground-water can provide a good relief to the farmers. In the command areas of irrigation canals, the sudden demand from the extensive area arising out of a long break in monsoon cannot be coped with by the canals and distributaries because they do not have enough carrying capacity to convey water required by all the fields simultaneously. The irrigation conveyance systems are designed essentially for a rotational schedule. Hence sudden peaks in the demands can best be met only by pressing into service all the wells in the command. Conjunctive use of ground-water and surface-water not only optimises the use of water resources in an Irrigation Command, but also makes the irrigation system operationally more viable during the periods of stress.

USE OF LESS DEPENDABLE YIELDS

There have been demands for improving the availability of water for drought areas by resorting to the use of lower dependable yields. In India normally the drinking water supplies are planned for almost 100% dependability, hydro-power systems for 90% dependability and the irrigation systems for 75% dependability. For the drought areas, use of average flows or 50% dependable quantities have been recommended by many Commissions and Committees to increase the availability of water mainly for the agricultural purposes. Minor Irrigation tanks (i.e., which have culturable command area of 2000 ha or less) are already being planned for 50% dependable water.

But it is seen that the systems planned for the use of waters of lower dependability do not function effectively unless they are handled with greater administrative and managerial skills and there is a greater social responsiveness amongst the beneficiaries. Use of lower dependable flows means inviting larger variations on the supply side from year to year. Unless the distributive mechanism is properly refined to distribute the shortages amongst the recipients of water in a successful manner the system fails support the extended clientele effectively. In the years of shortages, it should not happen that the needs of a few only are met with in full, while some others are totally eliminated from the protective fold of the distribution system. The shortages will have to be shared by all the potential users. Achieving this objective is a difficult task and a challenge to the managerial skills of the system's operators. Unless specific clear rules are laid down for sharing the shortages amongst the beneficiaries, it is difficult to regulate the short supplies.

ROLL OF PASTURES & FORESTS

Water management cannot succeed without simultaneous coordinated efforts in land management. In the drought-prone areas of Deccan, there is just neither enough water to irrigate all the lands, nor are all the lands fertile enough to support agricultural farming. Hence pastures and

trees farming will have to form an integral part of the land and water management strategy. While grasses can grow on the moisture from the shallow soil cover, the deep root system of the trees can draw their moisture from the deeper ground-water zones and survive under a drought condition. Forest covers can also help in the ground-water recharge process through their root system by reducing evaporation under their dense canopy by adding leaf litter and humus.

PLAN FOR THE BASIN

For optimising the output of 'land-water inter-action', it is desirable to have afforestation and development of grass lands in the upstream portions of a basin to reduce the silt load in the run-offs, followed by cluster of cities and industries in the middle portion of the basin, as their effluent can be profitably used along with the natural river supplies in the downstream portion of the basin where the agricultural activities could best be concentrated.

In the past, many historic cities and associated social activities were located not at an appropriate place from the consideration of the basin's management. For maximising the social gains from the available natural environmental endowments of the basins, some rearrangement of the Society's activities over the basin may have to be thought of very seriously in the drought-prone areas. Rather than trying to take water at any cost to a place where the demand exists, future planning efforts will have to be in the direction of managing the demand in such a manner so as to be in harmony with the natural capabilities of the environmental system as a whole. This requires a comprehensive integrated approach to the basin planning.

EMPHASIS ON ACTIVITIES REQUIRING LESS WATER

The primary objectives of any management plan for a drought-prone area would be to minimise the effects of a drought situation on the economic activities in that area. In this context, the activities which are less dependent on use of water should be the most preferred ones. Commercial activities such as shops, schools, offices and hospitals require little support of water other than that for domestic purposes. Many industries like toy-making, structural fabrication and weaving also do not need much of a support from the water resources. Grain cultivation is a highly water consumptive activity by and large. It requires ten times more water for every person employed therein than that required for the above mentioned other economic activities. Hence while drawing up a perspective programme of economic development of the drought-prone areas or while operating a water supply system for that area preference in the use of arranged supplies of water should be given to the commercial and industrial activities having low water consumption.

Proper management of water is the kingpin in the development of the drought-prone areas. There are no general solutions possible. They will have to be areas specific, because of the hydrological peculiarities. It has also to be remembered that the drought-prone areas cannot be modelled on the lines of the development of the other favourably placed areas. The pattern of development of the drought-prone areas will have to be quite different from that for the others.

MANAGEMENT OF A DEVELOPED STAGE

In any case, insulating capacity of a source depends upon the extent to which the use of the resource has been developed. Once a full development stage is reached, there is no spare capacity in the system to absorb the deficits, and consequent slumps in economic outputs, agricultural or industrial, are unavoidable. However, compared to the unirrigated areas, soils in the irrigated areas continue to retain more moisture and therefore provide greater resistance to a drought situation.

Because of the general developmental phase in India over the past few decades and extensive relief measures undertaken during the drought years, access was established to newer additional resources of water during the periods of stress and hence the effect of the drought situation stood considerably softened. However, in many sub-basins all the resources now stand harnessed. Hence in the years to come greater reliance will have to be placed on improved operational skills and water saving measures for tackling a drought situation.

PREPAREDNESS FOR A DROUGHT

In spite of any high level of efficiency in managing the waters for the drought-prone areas, the input of water to the economic system of this area is bound to be variable resulting in considerable variation in the economic outputs also. Hence for reducing the distress, standby relief arrangements are a must. They would include squads with equipment like drilling rigs for clearing and deepening of wells and tankers for import of water, and seed, fodder and food grains banks in the drought-prone areas. There will always have to be an administrative preparedness for meeting a drought situation and a social awareness about the drought resistance measures. Neither technological excellence of the manmade water systems nor administrative skills alone - but an enlightened society can fight the drought effectively and hence the need for continuously undertaking educational programmes for making the drought-prone society highly water conscious.

POLICIES & PLANNING PROCEDURES FOR CONJUNCTIVE USE PROJECTS

M.A. CHITALE[1]

I am indeed very happy to be amidst you this morning to share some of my thoughts with you on the subject "Policies and Procedures for Conjunctive Use Projects" which has assumed so great an importance in the recent years. The concept of "Conjunctive Use" of surface and ground water in irrigation projects is not a new one. As a matter of fact, it has been practised since several decades in our irrigation projects. But policies as well as the details have undergone considerable changes in the light of our experience in the recent years.

To the end of Sixth Five Year Plan, a potential of about 68 m.ha. has been created. Of this, about 28 m.ha. is from ground water development alone. This indicates the important role being played by the ground water potential in the irrigation development programmes of the country. Conjunctive use of ground and surface water will improve the utilisation status. But that would involve adoption of new techniques and innovations to meet the requirements of not only the irrigation but also the growing demands from certain other sectors like drinking water and industry.

With the increasing demand for water from every sector and the water resources available remaining limited, the future scope for expansion of water related activities will depend to a large extent on the recycling and reuse of water and minimisation of consumptive use. Cheap methods for recharging the ground water squifers and repumping for use will have to be devised.

One of the important components and a net loss component in the hydrological cycle is evaporation. From the point of water resources account, one would be interested to know the exact losses through evaporation. Pan evaporation exceeds 250 cms. (100 inches) over Rajasthan, Saurashtra, Kutch, interior Maharashtra, Rayalaseema and parts of North interior Karnataka. Over some parts of India pan evaporation exceeds 325 cms. (130 inches). For correct assessment of evapotranspiration which is also equally important for the Hydrologists, the availability of data is extremely meager over the country. The India Meteorological Department has, however, compiled some charts of computed values of annual potential evapotranspiration, highest mean monthly evapotranspiration and the least monthly evapotranspiration for different months for the whole country. The study of evaporation losses from reservoirs in the country has also in my opinion, not so far received adequate attention. Studies on the relation between pan

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1. Chairman, Central Water Commission, Ministry of Water Resources, New Delhi. Key paper presented by the author in the Seminar on "Conjunctive use of Surface and Ground Water Resources", (Feb. 10-13, 1986), New Delhi.

evaporation and evaporation over extended surface and the atmosphere over the lakes have to some extent been handicapped due to lack of proper observational data, so far. These aspects should receive adequate attention in the next few years in any water resources assessment studies.

Evaporation losses in reservoirs as also on the field are substantial. According to an estimate made some time back quantitatively about 70 M.Ham. evaporates out of the total precipitation of 400 M. Ham. About 6 M. Ham. evaporates from reservoir surfaces and an equal amount is lost from high water table areas. Evaporation losses from reservoirs would increase to about 10 M.Ham. on further development of water resources. Thus in the ultimate stage of development, evaporation losses from reservoirs and tanks are likely to consume a substantial portion of total utilisable water resources of the country. Further, evaporation losses from irrigated fields are also enormous, as the land area on which the irrigation water spreads is several times larger than the area of reservoir surface. Research is still continuing by way of developing chemicals for use in reservoir areas as well as by way of mulching of soils for minimising losses in fields through evaporation.

Suitable agricultural practices to reduce such evaporation losses from irrigated fields will also have to be developed and propagated. It is also to be noted that evaporation losses are much higher during the hot summer months. It is, therefore, necessary that irrigation strategies and reservoir evaporation strategies have to be so formulated as to avoid these heavy losses in summer months.

In the underground condition, water resources are safe and do not suffer such losses. Hence it would improve the overall utilisation of water resources by storing as much of water as possible under ground rather than on the surface.

As you are all aware, conjunctive use has been in vogue in our country for some years now, though to a limited extent in several parts of the country. Ground water has been extensively used along with surface waters in systems such as Cauvery Delta in Tamil Nadu, Godavari - Pravara Canal Systems in Maharashtra, the Gang Canal and the Western Yamuna Canal in Haryana and more recently on a large scale in parts of Punjab and Uttar Pradesh. Ground water extraction has also been planned in the Sardar Sarovar Project command beyond Mahi with a view to control ground water table which is yet another example of conjunctive use.

The filter points installed in the Cauvery Delta enable the farmers to give a watering to the crops after the closure of canals, wherever necessary. Under the Pravara and Godavari Systems in Maharashtra, a number of farmers constructed masonry wells and installed pump sets to supplement canal supplies for growing sugarcane. In Maharashtra, under the block systems of irrigation, the area under sugarcane is restricted.

Where canal water is available for 8 months in a year, the demand for the remaining 4 months has to be necessarily met by exploiting the ground water resources of the area. Similarly in Uttar Pradesh, conjunctive use of surface and ground water is achieved through batteries of tubewells installed in the tail reaches of the distribution systems. On the other hand in the Western Yamuna Canal in Haryana, a some-what different arrangement has been adopted for augmenting canal supplies. A number of tubewells have been sunk by the side of the main canals and water is extracted from them and put into the canals. Yet another useful mode of conjunctive use is the construction of tubewells in irrigation commands to lower the water table wherever it might have arisen as a result of seepage from surface irrigation. The extracted water is then used to supplement irrigation supplies as has been done in parts of Punjab.

Conjunctive use will have to play the same role in areas with saline aquifers. There are some crops which can tolerate a fairly high degree of saline water. The water resources particularly in arid tracts can to some extent be augmented by the combined use of surface and saline ground water. This could be done in certain areas of Gujarat and Rajasthan where brackish water has been found to exist.

Studies have shown that any investment on tubewells sunk to tap ground water aquifers is amply justified by the increased production through high yields and multiple cropping. Also returns are quick with no time lag in utilisation nor are any additional funds required for development of command area, since most of the area is already under irrigation. It would therefore follow that conjunctive use of surface and ground water in existing irrigation systems should be accorded the highest priority.

All irrigation commands have a good scope for conjunctive use of surface and ground water because the same irrigation water applied on the land gets partly converted into ground water, even though the relative proportion of such conversion will depend upon the soil, texture, plant intensity and the climate. A systematic study needs to be carried out by each State to quantify the contribution of the irrigations to the ground water systems because one has to guard against indiscriminate and over exploitation of ground waters as these may lead to serious undesirable effects. In this context, there is a need for legislation to regulate exploitation of ground water.

Integrated and conjunctive use of surface and ground waters in my view, has not so far been given the extent of attention and consideration it deserves. There is a dire need for developing it on more scientific lines in order to derive its full benefits. It is an agreed fact that irrigation supplies from a single source, surface or ground water are often inadequate to meet the requirements of crops in time and quantity. This is particularly so in the case of high yielding varieties of crops which have more exacting water demands. Both traditional and high yielding varieties of crops are being raised in the

project commands in the same season. On account of their differing base period and critical stages of irrigation it will become more difficult to meet their water requirements from a single source. Both the sources have, therefore, to be integrated and used conjunctively in order to meet the irrigation requirements. There are also certain legal and administrative constraints which hinder the proper development of integrated and conjunctive use. There is, therefore, a need for unified water law covering both surface and ground water. It is also equally necessary to have a unified administrative set up both at the Centre and at State levels. The economic and financial policies particularly in regard to the water rate structure have an important role and these have to be reviewed and suitably revised to encourage integrated and conjunctive use. Cropping pattern is also an important factor and has to be suitably evolved for ensuring optimum, integrated and conjunctive use.

Irrigation development in drought prone areas of the country is rather very poor and it is necessary not only to provide increased facilities for irrigation but also to encourage integrated and conjunctive use of surface and ground waters. Where land resources are in excess of water resources, the aim should be to increase the production per unit of water. In fact such a situation prevails in nearly 2/3 of the cropped area in the country. The integrated and conjunctive use will help in achieving this objective.

In the recent times the term "conjunctive use" of surface and ground waters does not merely envisage, canal irrigation to be supplemented by ground water, but also on the contrary, in certain areas of the country, supplementing of ground water irrigation with canal supplies. This concept will need to be developed for beneficial use of our water resources.

But well construction in irrigation commands will have to be regulated by law so that the size and spacing of wells is controlled to some extent to facilitate the systematic exploitation of ground water resources.

In this context, it may also be noted that the various Water Dispute Tribunals which have adjudicated upon the water disputes in river basins like Krishna, Godavari and Narmada have held a view that ground water in general is the property of individual States and the beneficiaries in the land holdings. Hence the States and the local irrigation authorities have considerable flexibility and authority for planning the use of their ground waters.

To effectively achieve the conjunctive use of surface and ground waters and the resultant benefits, there should be an integrated organizational structure for the use of all forms of water resources not only at the Centre but also in the States and more so for each river basin. For a long time, the development of surface waters has

progressed separately from that of ground waters. While the ground water development for the benefit of dry land agriculture may continue on a separate footing, the entire ground water development in the irrigation commands cannot here-after be looked upon as an independent activity. It will have to be properly juxtaposed with the surface water distribution systems because these distribution systems are also indirectly the recharge systems for the ground water.

With the establishment of Command Area Development Authorities, it was hoped that various activities in the Command Area which have a direct bearing on the management and utilization of waters would be brought under the direct fold of Command Area Authorities. But for various reasons, the ground water development activity in the command areas has still not been fully integrated with the other water management activities of the Command Area Authorities. It is high time that the ground water organizations working in the Command Areas of irrigation projects are brought under the umbrella of the CAD activities.

A SUPPLEMENT OF THE KEY PAPER

POLICIES & PLANNING PROCEDURES FOR CONJUNCTIVE USE PROJECTS

M.A. Chitale[2]

1) Conjunctive use of surface and groundwater is being practised in India over several years in one form or the other. A good amount of experience has been gained. It should be possible now to take stock of all these experiences and evolve clear policies and guidelines for the further developments.

2) While doing so we will have to take a special note of the three new developments that have taken place and which have profound bearing on the development of the conjunctive use of water. These three factors are;

1) The availability of electrical power for the pumps almost in all the villages in the Command Areas;

2) New techniques of Tubewell boring enabling successful establishment of deep tubewells;

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2. Chairman, Central Water Commission & Ex-Officio Secretary to the Government of India, Ministry of Water Resources, New Delhi. This supplement to the key paper for the Seminar covers some additional points on which the author focussed the attention of the Seminar during his address.

3) Assistance available from the Agro-meterological services for scheduling of water requirements through their weather forecasts.

All these factors together indicate the feasibility of undertaking irrigation projects on the basis of conjunctive use of water in a more confident manner and on more scientific lines. In view of the shortage of water in most of the basin in India, the possibilities for conjunctive use should be fully explored.

In the Indian context, the important factor to remember while planning the water resources system is the considerable loss of water by evaporation. As against the average precipitation of 1.2m., the plan evaporation losses in many areas exceed even upto 2.5m. Hence the first objective of a water resources plan should be to minimise the evaporation losses from the system. It is in this context that the best use needs to be made of the underground water storage capacity available in the valley and particularly beneath the Command Areas of the project. Water stored underground is protected from evaporation losses. Hence rather than carrying over the water from wet season to dry season or from wet year to dry year in surface storage, it would be most advantages if this could be done through an underground storage.

In this context the seepage losses that take place from the canal systems need not be looked upon as a net loss in all the situations. In most of the cases aquifers or within a reasonable reach of economic exploitation and the water that has seeped into the ground can very well be reused again in the system.

At present there is not enough scientific data on the evaporation losses from the reservoirs and from the irrigation farms. The losses from the irrigated farms are in fact many times larger than those from the reservoirs. Extensive data on the phenomenon of evaporation losses needs to be collected early along with a programme of research for minimising these losses by suitably modifying the irrigation practices.

Plants draw their support from the rain water that soaks the soil from the surface water canal systems or from groundwater pumping. The water in these three forms really forms a tripod supporting the crop growth. It is for the engineer to develop a proper mix of any two categories of water from the above three or for all the three categories together for maximising the yields in a given situation. For example long duration kharif crops can be very well supported from the groundwater from the local wells, thereby providing an excellent combination of rain water with groundwater for supporting the crop growth. Cotton grown in the Vidarbha region of Maharashtra provides an excellent example of such a mix being already widely use in a profitable manner.

While some studies have been carried out on the quantity of precipitation water that gets transferred into the groundwater phase, there is not enough information about the quantity of groundwater recharge from the water used for surface irrigation unless the transformation parameters from one phase of water to the other are clearly quantified it will not be possible to work out optimised mixes of water doses from the three possible sources together. Future fields studies should therefore immediately concentrate on these missing links in our knowledge so that the planning for the conjunctive use of water can be based on realistic data.

There would also be certain legal hurdles in establishing the irrigation practices based on the conjunctive use of water because there is a considerable difference in our understanding about the ownership of different phases of water. While surface water is generally accepted as a Government property, the groundwater is generally considered as being owned by the private person namely; the farmer below whose land the groundwater exists. Under the latter assumption, it is conveniently ignored that the underground water system exists as a continuum and can not be compartmentalised into different ownership blocks. For the development of conjunctive use on scientific lines spacing of wells will have to be scientifically planned. The legal framework should permit of such a planning and sharing of the water from the well by the different farmer irrespective of the position of the well. Unless there is a unified law covering both surface and groundwater uses, it would be difficult to achieve the full potential available under the conjunctive use approach.

For long the development of ground water has been handled in separation and isolation from the developmental activities connected with the management of surface waters. The separatist approaches will have to be immediately given up and the entire water resources planning for the Command Area will have to be achieved in a coordinated manner on an integrated basis. A good beginning has already been made in India by setting up of the Command Area Development Authorities for most of the large size projects. Groundwater development has already been included under the group of activities to be coordinated under the CAD umbrella. But the unfortunate part is that the desired integration of the various activities has not yet taken place under the CAD umbrella. No integration of the physical systems like the water resources system is possible unless all the concerned actors on the scene are integrated organizationally and brought together. For developing the conjunctive use of water, we will have first to develop properly integrated organisations.

To sum up there are four main areas in which serious gaps exist which will have to be plugged early to achieve the objective of conjunctive use of water. There are;

1) The knowledge gap

2) The planning gap

3) The legal gap &

4) The organizational gap

It would be desirable if we put our thoughts together and come out with specific recommendations as to how these four gaps should be bridged in the near future.

INLAND FISHERIES PROJECT IN INDIA

S. SAROJA AND A. SARADA

I - INTRODUCTION

Inland fisheries in India, is an important economic activity. Capture fisheries is by far the more dominant in the total fish production. Capture fisheries is practiced mostly in the major rivers, lakes and reservoirs of both fresh and brackish waters. It involves various types of seining and gill-netting for a number of species of carp, catfish and miscellaneous fish in fresh waters, and hilsa and mullet in brackish waters. Capture fisheries production has not kept pace with total fish production, because of the deterioration of the fish habitat due to proliferation of water control structures, industrial water use, and extensive overfishing in many of the traditional grounds where the most important commercial fresh water species are harvested.

Fish farming is practiced throughout India, but the five leading pond-culture States West Bengal, Bihar, Orissa, M.P. and U.P. accounted for 90% of the total cultured carp production. The main species farmed are, in order of importance, cattle mrigal and rohu (all Indian major carp).

Indian fish ponds are typically rainfed and generally range in size from 0.5 ha. to about 2 ha; averaging about 1 ha. Where ground water levels are high, as in the lower gangetic delta regions and low lying areas of other large river basins, ponds are perennial and have sufficient water for fish culture all year round.

Most fish ponds in India are owned by government agencies such as State Revenue or fisheries departments or village panchayats. Only in West Bengal, Bihar and Orissa private pond ownership is substantial. Private ponds are generally owner - operated.

II - THE PROJECT

India has most of the necessary elements and a great potential for rapid expansion of fish farming - an improved technology, extensive domestic markets, trained personnel, experienced fish farmers and substantial under utilized fish pond resources. Lacking however are the high quality fish seed in large quantities and the broad institutional and organisational base needed to unlock this potential. The Inland fisheries project provides these missing key elements through construction of modern fish hatcheries to produce high quality fish seed, and support of substantial institutional development and strengthening in the Inland fisheries subsector.

The project assists GOI and five participating states, West Bengal, Bihar, Orissa, Madhya Pradesh and Uttar Pradesh, in their efforts of implement fish farming development programmes. The main objectives of the project are:-

(1) To increase carp production in West Bengal, Bihar, Orissa, M.P. and U.P and

(2) To provide a basis for the future commercial development of the carp seed industry in India, which is essential to increase production of inland fish in the future.

The Project is to provide

(1) Credit to State Fish Seed Development-Corporations for construction of about 27 modern fish hatcheries to be used to produce carp fingerlings.

(2) Credit to fish farmer for improvement of fish farms, and

(3) Funds for strengthening fisheries extension, establishing training centres and technical assistance.

III - PROJECT AREA

The project would cover a total of 58 districts in the five project States. The project districts were selected to be contiguous areas where fish farming is generally practiced and where marketing and transportation facilities are available.

With in the project area, three general fish pond models (types, A,B,and C representing typical conditions for project analysis and cost estimation purchases) are to be developed.

The details of the conditions of the project area, actual fish pond improvement and input requirements are as follows:

Fish Hatcheries:- Investments in hatcheries are designed to remove the constraints to increased fish farm production in the project area due to inadequate supply and poor quantity of fingerlings for stocking fish ponds. The project is to finance about 27 hatcheries in 10 ha, and 25 ha, model sizes in the project states. These are to be constructed on contract basis and to be operated by a State owned fish seed Development Corporation to be established in each State, which is to employ suitably qualified engineers for design and supervision during the construction period. At full development, the hatcheries would produce a total of

nearly 460 million carp fingerlings. Details of West Bengal hatcheries are, 5 of 10 ha. hatcheries, 4 of 25 ha, hatcheries and total production of fingerlings are 158 million.

Fish Pond production Model	Yields Kg/Ha	Fingerling Stocking rate Nos./Ha	Financed Year 1. Inputs Rs/Ha	Annual Input-cost Rs/Ha.	Fish Pond Investment Cost Rs/Ha
Type A	800	2500	524	1154	940
Type B	1500	2800	792	2022	2772
Type C	2500	5000	1020	6920	6202

The project is to provide for construction of approach roads, linking project hatcheries with existing communications. The existing Fish Farmer Development Agencies (FFDAs) would be strengthened in Districts where GOI sponsored FFDAs are already operating and new FFDAs will be established with Stat sponsorship to serve the remaining districts.

FISH POND CREDIT

The project is to provide credit through participating banks (PBS) refinanced by NABARD to individual fish farmers, groups or cooperatives to finance investment in fish pond improvements and first year cash inputs. Improvements and inputs would be financed together as a minimum package loan of up to seven years including a grace period of upto two years. All borrowers would be pond owners, or operators with a pond under a lease of atleast 10 years length with specified terms during the lease period which would ensure adequate incentives to the fish farmers.

TRAINING CENTRES FOR FISHERIES EXTENSION

The project is to finance training centres to train extension workers for FFDAs New Training Centres would be established in West Bengal, Bihar and U.P. and the Training Centre at Raipur in M.P. would be strengthened. Training centres would train primarily extension workers in fish pond culture, providing both basic and refresher courses and practical applications of fish culture and extension principles. Training center investments include a main building for class rooms and offices, quarters for staff and trainees, a guest hostel, vehicles, audio-visual equipment, extension kits and laboratory equipment.

TECHNICAL ASSISTANCE

Technical Assistance under the project would provide for a hatchery engineer consultant and a hatchery-management specialist. The hatchery engineer would be an individual with extensive experience in the practical design and construction of carp hatcheries of the general type envisaged for the project. He would be employed by the GOI and would assist all project States during the early stages of site selections, detailed hatchery design and development and adapting of designs to local conditions and sites.

The hatchery management specialist would be an individual with extensive experience in commercial fish hatchery operations. He would help train hatchery operating staff for the first one or two hatcheries in each state prior to their completion, and he would assist with break-in operations of these early hatcheries. He would be employed by GOI and would be available as needed for consultation on special operational problems during the project period at the request of the project states.

IMPLEMENTATION AND DISBURSEMENT

Estimated total All India project costs including duties and taxes would total Rs. 350.5 million. Detailed cost estimates and phasing are given in Annexure I and Ia. We have selected West Bengal for the detailed study of the Inland Fisheries project, and the particulars are in the next chapter.

INLAND FISHERIES IN WEST BENGAL

West Bengal has a land area of 8,85,551 sq.km. According to the 1981 census, population of the States is 54.5 million. The annual requirement of fish in the State is estimated at 5.37 lakh tonnes, according to the recommendation of National Commission of Agriculture. Against this, production of fish in the State during 1985-86 was 4.24 lakh tonnes, of which 3.84 lakh tonnes were produced from inland fisheries resources.

The deficiency of fish in the State is not a new problem. Though fisheries Department had functioned as a separate department within the government of West Bengal since Independence, very little development work could be done excepting rendering technical advice to the fish farmers and running of some nursery projects for fry production in some selected districts, along with procurement and distribution of ancillary goods like yarn, coalter etc. to fisher men.

Mass scale transfer of population from east-while East Pakistan to West Bengal, rapid urbanisation, extensive conversion of water areas for

providing housing facilities and also industrialisation added to the problem of fish scarcity in the State. Absence of adequate infrastructure for communication of extension messages towards fisheries development, and the meager allocation of fund since first Five Year Plan period hindered the progress of fisheries development in the State.

The following table gives an account of the allocations of fund and its utilisation since First Five Year Plan.

TABLE - I

ALLOCATION OF FUNDS UTILISATION SINCE FIRST FIVE YEAR PLAN

(Rs. in lakhs)

Period	Year	Allocation Rs.	Utilisation Rs.	% of Utilisation
First Plan	1951-56	154.47	40.50	26.22
Second Plan	1956-61	74.74	60.02	79.24
Third Plan	1961-66	204.55	111.64	54.58
Annual Plan	1966-67	55.00	43.90	79.82
Annual Plan	1967-68	55.00	41.46	75.38
Annual Plan	1968-69	55.00	43.55	79.18
Fourth Plan	1969-70	274.76	255.19	92.88
Fifth Plan	1974-79	1049.73	234.16	79.46
Annual Plan	1979-80	447.00	226.49	50.67
Sixth Plan	1980-81	510.00	326.27	63.97
	1981-82	560.00	269.35	48.10
	1982-83	371.00	281.06	75.76
	1983-84	450.00	431.54	95.90
	1984-85	830.00	674.14	92.35
Seventh Plan	1985-86	750.00	737.75	98.36

It is apparent from the above table only during the last five Year plan an over all attempt was made for the development of fisheries in the State.

More importance was given to the inland fisheries sector as the bulk of the fish production come from this Sector and also because of the consumer preference for the fresh water fish.

OBJECTIVES OF THE PROJECT

The objective of the inland fisheries project are:-

(1) Conservation of fish in different types of inland waters during the breeding season for their better propagation.

(2) Uplift of socio-economic condition of fisher men community by using fisheries development programme as a means for improvement of economic condition of poor fishermen.

(3) Repairs of environmental degeneration through development of fisheries and;

(4) Generation of rural employment and income through fisheries development programmes.

Selected districts in West Bengal are 1) Midnapur, 2) Bankura, 3) Howrah, 4) Hooghly 5) Purulia 6) Burdwan, 7) Nadia, 8) Birbhum, 9) Murshidabad 10) Malda and 11) West Dinapur - the details of the pond models and type of fish hatcheries to be the developed in these districts are as follows:

Cultivable Pond Area	137,000 Hectares
Project Pond Area	34,000 Hectares
A Type Model (low)	0 Hectares
B Type Model (Medium)	3,000 Hectares
C Type Model (High)	31,000 Hectares

The total cost estimates and phasing as of January 1979 are shown in Annexure II and IIa.

INLAND FISHERIES OF THE STATE CONSIST OF :-

	Type of fishery	Area in Ha.
1.	Pond	2,76,201.90
2.	Sewerage fed fish	4,082.96
3.	Paddy cum fishery	23,887.09
4.	Reservoir fishery	16,738.80
5.	Beels (Ox Bow lake)	41,781.65
6.	Rivers	1,72,586.63
7.	Canals	80,085.71

Besides the State has 2.10 lakh ha, of brackish water fisheries potential. Pond fishery occupies an important position amongst all the inland fishery resources of the State of the total 2.76 lakhs ha, of available pond water 70.28% are in cultivable condition, 19.97% are semi derelict which can be made suitable for pesiculture with little improvement and remaining 9.75% are in derelict condition requiring heavy capital investment for reclamation.

Fish farming is an age old practice in the State, and now the recent advancement of science and technology,package of improved practices of fish farming is also available. Thus, in inland fisheries development programme emphasis has been laid for development of pond fishery. The plan schemes, therefore aim at making different types of inputs of fish farming like training, fish seed and fund required for fish farming practices are available to the fish farmers.

TRAINING

Grass root level training centres have been set-up in different districts to give training in different disciplines of pesiculture. These training centres aim at imparting preliminary training to the fish farmers and fishermen. As these training centres are situated almost at their door steps, the trainees can avail the training facilities without disturbing their normal income generating activities.

At the district level, training centres are functioning for imparting relatively higher form of training to the farmers after they have successfully completed their training at grass root level training centre. Such district level training centres have been set-up in all the 17 fishery districts of the State. still high level of training is provided to the fish farmers through the state level training centre located at Kulia Research Station, Kalyani, District Nadia.

The following table shows the number of farmers trained during the period 1981 to 1986., and Annexure III gives a graphical presentation.

Year	No. of farmers trained
1980-81	1190
1981-82	1278
1982-83	4728
1983-84	7896
1984-85	22180
1985-86	23085

FISH SEED PRODUCTION

Fish seed is an important input for table fish production and this depends largely on the quality of input.

The spawn derived from the 'Bundhs' in Bankura District and the natural source of gangetic spawn, formed important source of fish seed in state. But the natural collection of spawn is a mixture of unwanted varieties of species. pure strain can be obtained from the bundhs. Mortality of tiny spawn over long distance is a major handicap. So the necessity of making the quality fish seeds available to the fish farmers in various parts of the State was felt.

The technique of hypophysation causing the fish to breed in confinement offered a partial solution to the problem. Through pain staking researches conducted by the Directorate, the technique of making fish to breed in captivity has been revolutionised during the last couple of years. The results obtained through research in this direction has been communicated to the private farmers through various extension messages and demonstration programmes. As a result breeding units of various sizes "glass Jar Hatchery" to a giant ones known as Eco-hatchery (based as chinese principle) are in operation in the state both in public and private sector. In the field of fish seed production the state has made a significant progress. Today as many as 136 portable hatcheries and 43 large sized Eco-hatcheries are in operation in the state.

Apart from the west Bengal fish seed Development Corporation Ltd. has been set up to cater to the need of fish seed to the private farmers. This corporation will operate 3 large sized Eco-hatcheries, at Jamuna dighi in the district of Burdwan and the other at Nanikpara in Midhapore district and the last one at Puccamati Mohalla in Musshidabad district. Of these three, the one at Jamuna dighi has already started functioning.

Through decentralisation of fish seed production units, it has been possible not only to reduce the mortality of seed during transportation but also to make it available to the fish farmers almost at their door steps and that too in required quantities. The fish seed production is as follows: (See Annexure IV for graphic presentation).

Years	Production of fish seed (in million)
1980-81	2300
1981-82	3200
1982-83	3150
1983-84	3910
1984-85	4200
1985-86	5000

During 1986-87 a target of producing 6000 million of fish seed has been taken up.

DEVELOPMENT OF POND FISHERY

Intensification of training programme or augmentation of fish seed production is futile unless the impact is felt as table fish production. Thus along with the training programme for raising fish seed, special emphasis was laid on development of pond fishery. A crash programme for this purpose was taken up under Inland Fisheries Project aided by World Bank for bringing 34,000 ha. of pond area under improved fish farming practices. Fish farmers' Development Agencies were set up in all districts to cater to the needs of individual farmers, assisted them in obtaining institutional finance and also made State subsidy available for the purpose of fish farming.

Co-operative societies of fisherman were organised and public water bodies like beels and settled with them on long term lease basis so that they could take up pisciculture in such water areas. Here also the fish farmers Development Agencies helped the fishermen's co-operative societies in the same way as they did in case of private fish farmers. Through such special drive 45,894.77 ha of culture fishery could be brought under improved farming practices during the Sixth Plan period benefiting 1,52,205 fish farmers/fishermen. The progress made under Inland fisheries project is given in the following table and Annexure V gives a graphical presentation.

Year	Water area covered (in ha.)	No. of beneficiaries
1980-81	67.51	639
1981-82	100.83	942
1982-83	1834.32	9213
1983-84	18539.00	44987
1984-85	14951.42	37902
1985-86	10347.69	58522
Total	45984.77	152205

Cumulative progress in West Bengal aided Inland Fisheries project is shown in Annexure VI.

FIELD VISIT

During the field study we have visited some fish ponds in Bardhman District and Jamuna Dighi Hatchery. The Relevant data about FFDA Bardhman for the year 1986-87 is given in Annexures VII, VIIa. In the year 1986-87, total number of beneficiaries sponsored in Bardhman District are 2098, and the water area covered is 1328.52 ha.

The estimated base cost as of 1979 for a 25 ha Hatchery complex is shown in Annexure VIII and VIIIa. where as the working capital requirement (revised estimate) for Jamunadighi 25ha Hatcheri, its repayment schedule and cashflow, Net Present Worth, Benefit Cost Ratio, and Internal Rate of Return are shown in Annexures IX, IXa, and IXb.

Cash flow projections of 1 Ha fish farm model A,B,C are shown in Annexure, X, Xa, and Xb.

ANNEXURE - I

INDIA

INLAND FISHERIES PROJECT

PROJECT COSTS EXPECTED PRICE INCREASES

(Rs.'000)

	1979	1980	1981	1982	1983	Total
Expected Price Increase Rates						
Civil Works	7%	7%	7%	7%	7%	-
Equipment	6%	6%	6%	6%	6%	-
Civil Works 1/_						
Base Cost Estimate	8,249	40,722	49,441	39,965	18,573	156,950
Physical Contingencies	930	7,032	9,012	7,319	3,153	27,446
Subtotal	9,179	47,754	58,453	47,284	21,726	184,396
Expected Price Increase	1,140	9,088	15,320	16,090	9,300	50,938
	10,319	56,842	73,773	63,374	31,026	235,334
Equipment 2/_						
Base Cost Estimate	8,891	18,491	14,093	19,489	24,099	85,063
Expected Price Increases	1,147	3,606	3,746	6,591	10,085	25,175
Total Equipment	10,038	22.097	17,839	26,080	34,184	110,238
Technical Assistance	1,386	1,306	942	666	598	4,898
Total Expected Price Increase	2,287	12,694	19,066	22,681	19,385	76,113
Total Project Cost	21,743	80,245	92,553	90,121	365,808	350,470
Price Increase as Percent of Base Cost Plus Contingencies						27.7%

1/_ Includes civil works and land.

2/_ Includes equipment, FFDA incremental staff FSDC headquarters equipment, and financed first year input.

ANNEXURE-I A.

	Rs. millions	....		US $ million	-		% of
Hatchery Credit	**Local**	**Foreign**	**Total**	**Local**	**Foreign**	**Total**	**Total**
West Bengal	26.3	1.0	27.2	3.1	0.1	3.2	8
Bihar	16.5	0.6	17.1	1.9	0.1	2.0	5
Orissa	12.2	0.5	12.7	1.4	0.1	1.5	4
Madhya Pradesh	13.6	0.5	14.1	1.5	0.1	1.6	4
Uttar Pradesh	10.5	0.4	10.9	1.2	- a	1.3	3
Sub-total	79.1	3.0	82.0	9.2	0.3	9.5	23
Hatchery Roads							
West Bengal	11.9	0.5	12.4	1.4	0.1	1.4	3
Bihar	5.9	0.2	6.1	0.7	- a	0.7	2
Orissa	3.9	0.2	4.17	0.5	- a	0.5	1
Madhya Pradesh	3.9	0.2	4.11	0.5	- a	0.5	1
Uttar Pradesh	3.9	0.2	4.19	0.5	- a	0.5	1
Sub-total	29.6	1.2	30.8	3.5	0.1	3.6	9
FFDAS							
West Bengal	8.6	0.4	9.0	1.0	0.1	1.1	3
Bihar	9.0	0.4	9.4	1.0	0.1	1.1	3
Orissa	4.5	0.2	4.7	0.5	- a	0.5	1
Madhya Pradesh	5.9	0.3	6.2	0.7	- a	0.7	2
Uttar Pradesh	8.0	0.3	8.3	0.9	- a	1.0	2
Sub-total	36.0	1.6	37.7	4.1		4.4	11
Fish Pond Credit							
West Bengal	35.2	-	35.2	4.1	-	4.1	10
Bihar	15.1	-	15.1	1.8	-	1.8	4
Orissa	11.5	-	11.5	1.3	-	1.3	3
Madhya Pradesh	10.0	-	10.0	1.2	-	1.2	3
Uttar Pradesh	7.1	-	7.1	0.8	-	0.8	2
Sub-total	78.8	-	78.8	9.2	-	9.2	22

Contd...

Hatchery Credit	Rs. millions Local	.... Foreign	Total	US $ million - Local	Foreign	Total	% of Total
Training Centres							
West Bengal	3.4	0.2	3.6	0.4	- a	0.4	1
Bihar	3.4	0.2	3.6	0.4	- a	0.4	1
Orissa	-	-	-	-	- a	-	-
Madhya Pradesh	1.6	9.1	1.7	0.2	- a	-	- a
Uttar Pradesh	3.4	0.2	3.6	0.4	- a	0.4	1
Sub-total	11.9	0.6	12.6	1.4	0.1	1.5	3
Technical Assistance							
Hatchery Engineer	-	0.6	0.6	-	0.1	0.1	-a
Hatchery Manager	-	0.6	0.6	-	0.1	0.1	-a
Project Preparation	1.8	-	1.9	0.2	-	0.2	-a
Marketing Study	1.8	-	1.8	0.2	-	0.2	-a
Sub-total	3.6	1.3	4.9	0.4	0.2	0.0	1
Base cost Estimate	239.2	7.7	246.9	27.8	1.0	28.8	70
Physical Contingencies	27.0	0.4	27.8	3.2	-	3.2	8
Expected Price Increase	73.6	2.5	76.1	8.5	0.3	8.8	22
Total Project Cost	339.8	10.7	350.8	39.5	1.3	40.8	100

a/_ Less than 0.05

ANNEXURE-II

WEST BENGAL

INLAND FISHERIES PROJECT

TOTAL PROJECT COST ESTIMATES

(Rs.'000)

	WEST BENGAL
<u>Hatcheries</u>	
Civil Works	23017
Equipment	1864
Land	2040
FSDE Headquarters	319
Sub total base cost	27240
Physical Contingencies	4603
Price Escalation	9506
Total Cost	41349
<u>Approach Roads</u>	
Civil Works	12150
Land	270
Subtotal Base Cost	12420
Physical Contingencies	2430
Price Escalation	4208
Total Cost	19058
<u>FFDA's</u>	
Incremental Staff	4554
Equipment	4475
Subtotal Base Cost	9029
Price Escalation	2892
Total Cost	11921

Contd....

	WEST BENGAL
Fish Pond Improvement	
Civil Works	22426
Equipment	7661
First Year Inputs	5099
Subtotal Base Cost	35186
Physical Contingencies	3364
Price Escalation	13292
Total Cost	51842
Training Centres	
Civil Works	1800
Equipment	1745
Land	75
Subtotal Base Cost	3620
Physical Contingencies	270
Price Escalation	617
Total Cost	4507
Technical Assistance 1/	
Hatchery Engineer	0
Hatchery Manager	0
Project preparation	0
Marketing Study	0
Total Cost	0
Total Project	
Civil Works	59393
Equipment	15745
Land	2385
Technical Assistance	0
Others 2/	9972
Subtotal	87495
Physical Contingencies	10667
Price Escalation	30515
Total Project	128677

1/- Technical Assistance will be responsibility of GOI.
2/- Includes FSDC headquarters, first year inputs and FFDA incremental staff.

ANNEXURE-II(A)

WEST BENGAL
INLAND FISHERIES PROJECT
ESTIMATED PROJECT COSTS AND PHASING
(000)

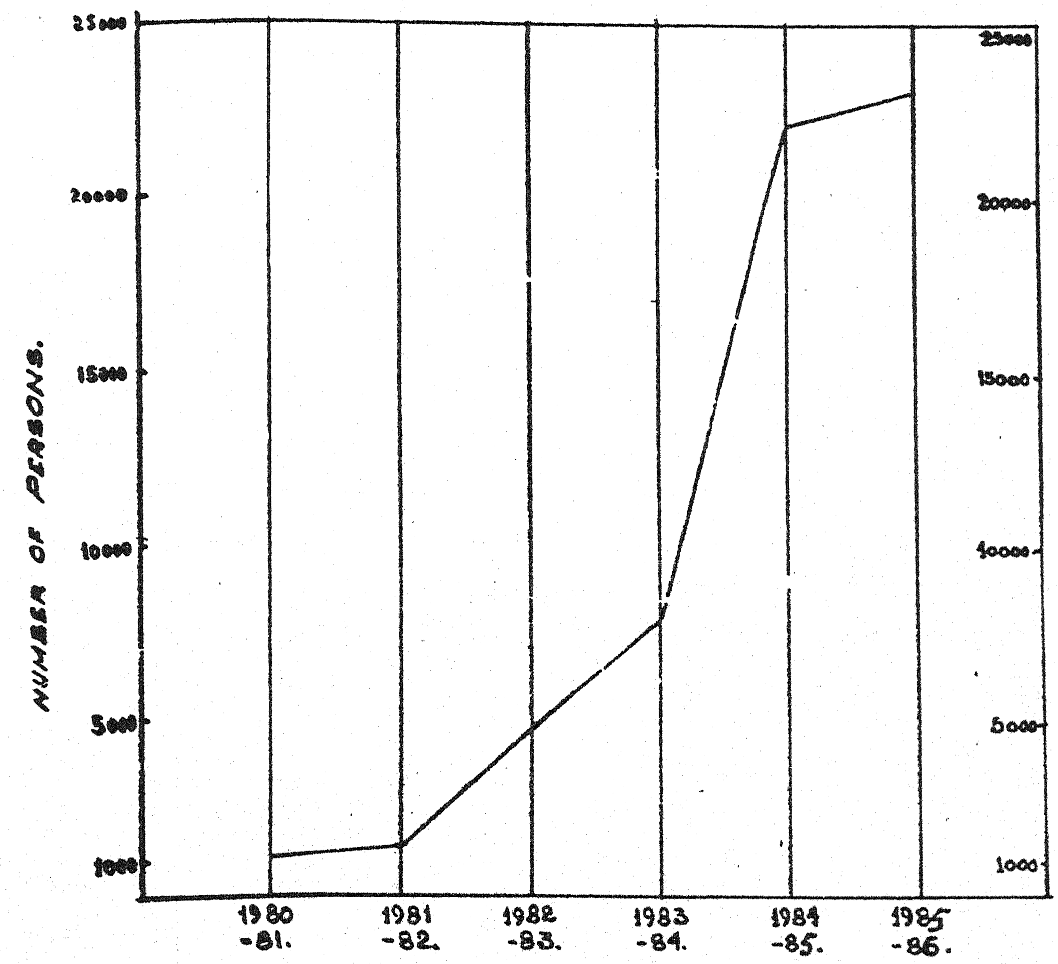
	1	2	3	4	4	Totals	for Exh.
<u>HATCHERIES</u>							
Civil Works	250	3806	6124	7608	5229	23017	259
Equipment	146	53	564	461	158	1864	636
Land	474	804	618	144	0	2040	0
FSDC Hors.	319	0	0	0	0	319	64
Base Cost	1189	5145	7306	8213	5387	27240	959
Physical Conti-gencies	50	761	1225	1522	1046	4603	46
Price Escalation	162	1139	2243	3277	2684	9506	475
Subtotal	1401	7046	10774	13011	9117	41349	1480
<u>Approach Roads</u>							
Civil Works	608	2430	3645	3645	1822	12150	486
and	90	90	90	0	0	270	0
Base Cost	898	2520	3735	3645	1822	12420	486
Physical Conti-gencies	122	480	729	729	364	2430	97
Price Escalation	101	561	1161	1467	912	4208	210
Subtotal	920	3573	5625	5841	3099	19058	793
<u>FFDA's</u>							
Incremental Staff	137	273	364	1275	2505	4554	0
Equipment	448	1387	492	1253	895	4475	407
Base Cost	585	1660	856	2528	3400	9029	407
Price Escalation	72	317	225	855	1423	2892	174
Subtotal	657	1977	1081	3383	4823	11921	581

Contd...

	1	2	3	4	4	Totals	for Exh.
<u>Fish Pond Improvement</u>							
Civil Works	0	2374	4755	7133	8160	22426	0
Equipment	0	785	1571	2356	2949	7661	0
First Year Inputs	0	520	1040	1561	1978	5099	0
Base Cost	0	3783	7366	11050	13087	35186	0
Physical Contigencies	0	357	713	1070	1224	3364	0
Price Escalation	0	784	2163	4196	6148	13292	0
Subtotal	0	4824	10242	16316	20459	51842	0
<u>Training Centres</u>							
Civil Works	900	900	0	0	0	3620	179
Equipment	873	872	0	0	0	270	8
Land	75	0	0	0	0	617	56
Base Cost	1848	1772	0	0	0	3620	179
Physical Contigencies	135	135	0	0	0	270	0
Price Escalation	248	369	0	0	0	617	56
Sub Total	2231	2276	0	0	0	4507	243
<u>Total West Bengal</u>							
Civil Works	1758	9514	14524	18386	15211	59393	805
Equipment	1467	3579	2627	4070	4002	15745	1162
Land	639	894	708	144	0	2385	0
Other 1/_	456	793	1404	2836	4483	9972	64
Base Cost	4320	14780	19263	25436	23696	87495	2031
Physical Contigencies	307	1739	2667	3321	2634	10667	151
Price Escalation	583	3177	5792	9796	11167	30515	915
Total West Bengal	5209	19696	27722	38552	37497	12877	3097

1/- Includes FSDC headquarters, first year inputs and FFDA incremental staff.

Annexure-III



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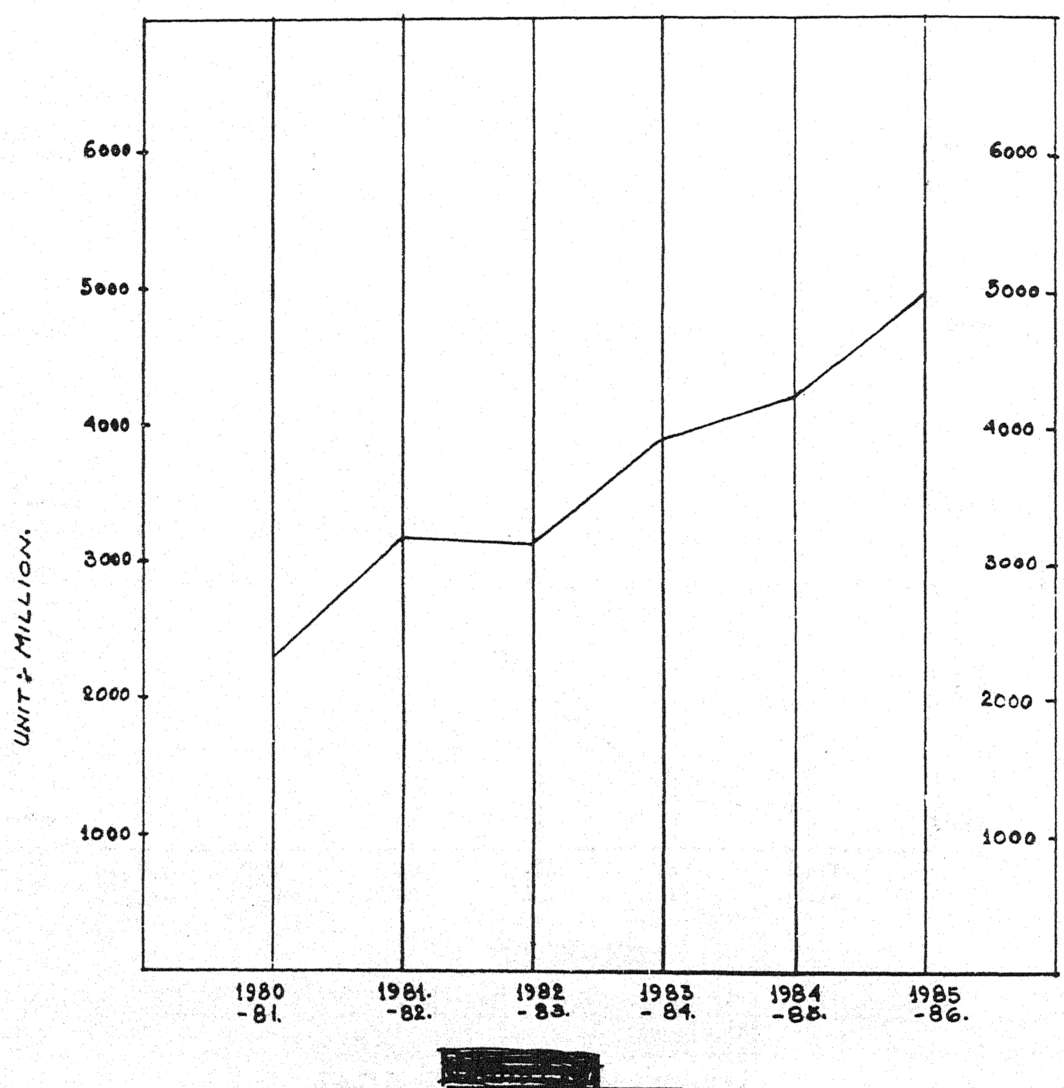
LINE DIAGRAM SHOWING NUMBER OF PERSONS
TRAINED IN FISH FARMING.

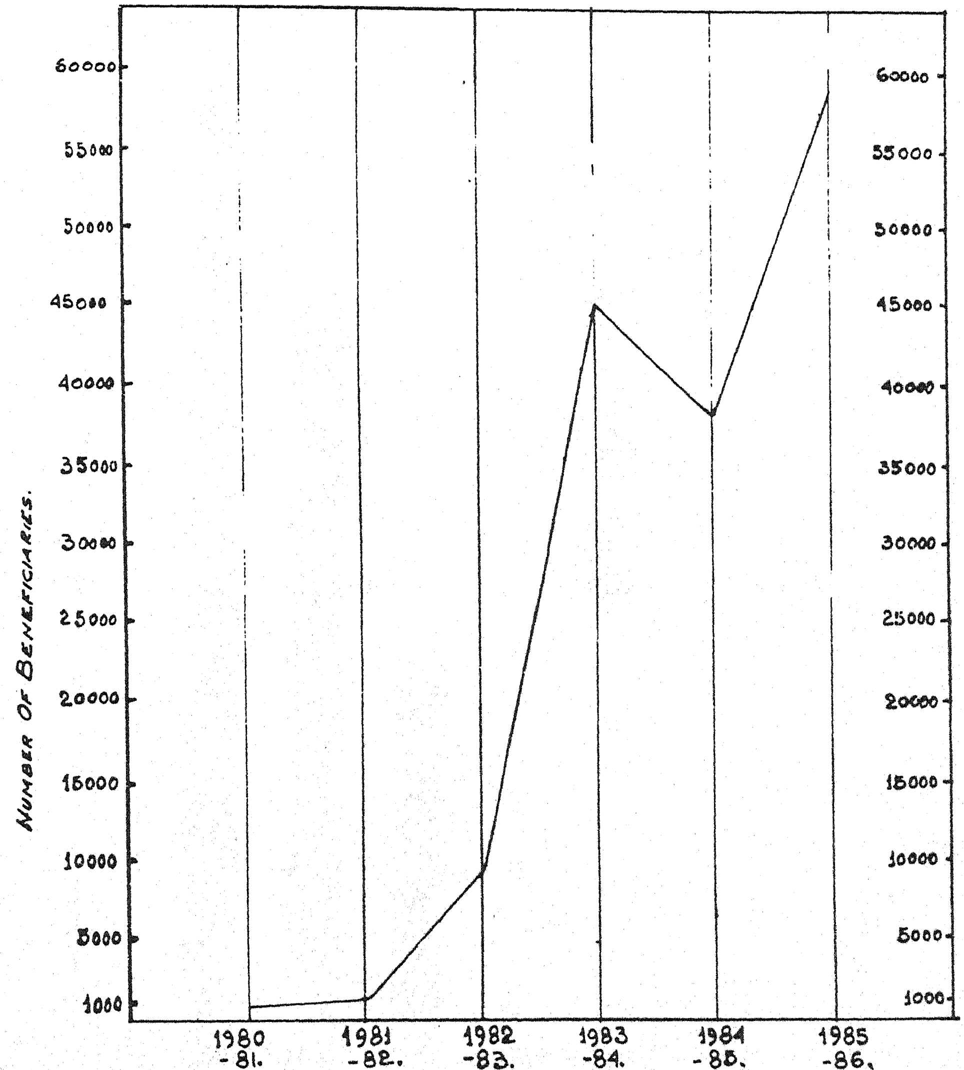
STATE.- WEST BENGAL.

Annexure-IV



FISH SEED PRODUCTION IN WEST BENGAL.

Annexure-V



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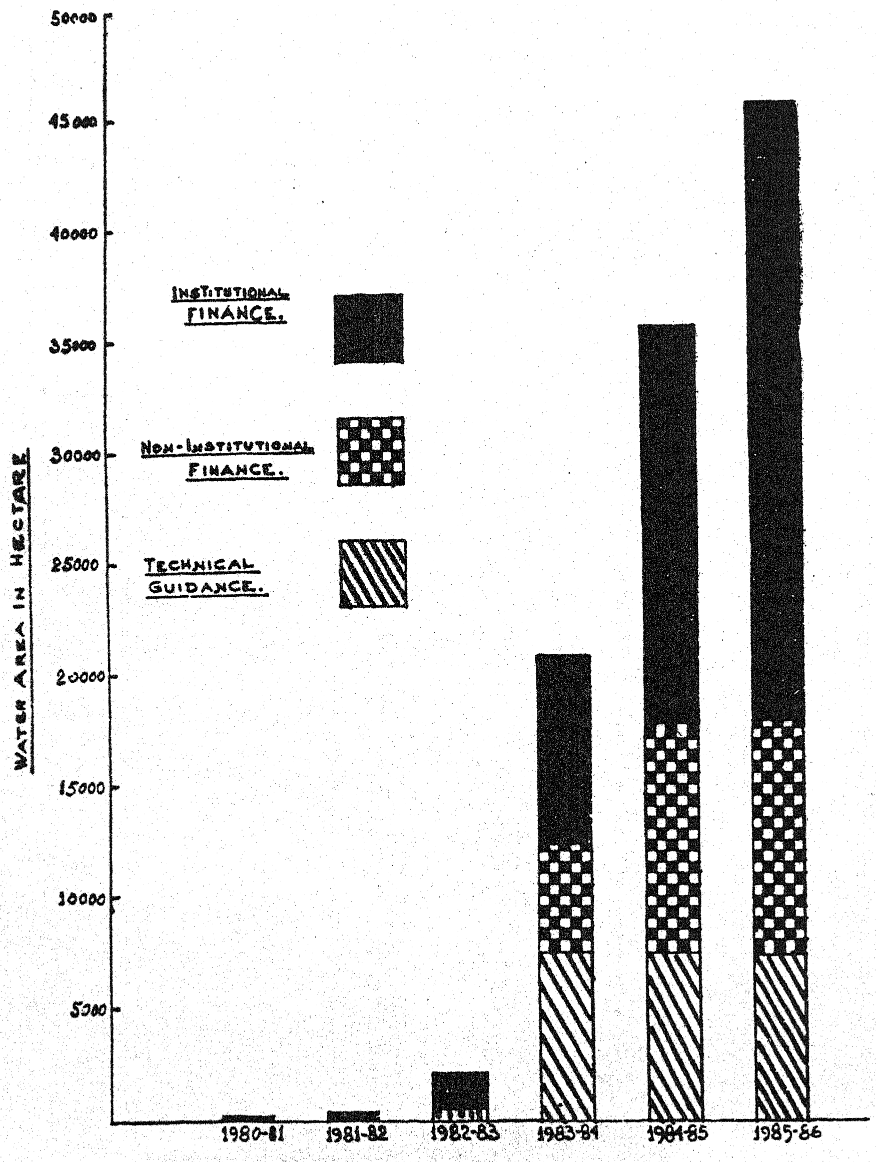
LINE DIAGRAM SHOWING NUMBER OF BENEFICIARIES UNDER WORLD BANK AIDED INLAND FISHERIES PROJECT

STATE:- WEST BENGAL.

Annexure-VI



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Cumulative Progress Under World Bank Aided Inland Fisheries Project.

State:- West Bengal.

ANNEXURE-VII. TARGET=750 HA

F.F.D.A BURDWAN

BLOCK PROGRESS REPORT OF SPONSORING AND SANCTION OF I.F.P. LOAN
CLASS FOR THE PERIOD FROM 1.4.86 to 31.1.87

Sl. No.	Name of the Block	No. of cases sponsored	Water area (in ha.)	No. of cases			Water area (in ha.)		
				Spill over	Current	Total cases	Spill over	Current	Total
1.	Burdwan	239	152.51	23	150	173	11.64	100.37	112.11
2.	Memari	48	47.02	3	19	22	2.10	11.40	13.50
3.	Memari-II	130	89.86	5	61	66	4.30	35.23	39.53
4.	Raina-I	54	46.78	2	27	29	0.66	24.12	24.78
5.	Raina-II	51	38.80	3	32	36	1.09	24.20	25.29
6.	Khandoghosh	94	60.30	7	69	76	2.80	42.15	44.95
7.	Bhatar	182	87.50	10	105	115	4.84	49.65	54.49
8.	Ausgram-I	33	14.06	4	12	16	1.23	4.90	6.13
9.	Ausgram-II	63	33.90	18	20	38	11.25	10.50	21.75
10.	Jemeipur	211	133.30	1	192	193	0.30	124.30	124.60
11.	Galsi-I	18	6.34	4	9	13	1.20	2.57	3.77
12.	Galsi-II	86	93.50	2	18	20	1.25	17.73	18.98
13.	Asansol	21	10.95	2	1	3	0.35	0.30	0.65
14.	Jamuria-I	34	29.05	11	30	41	7.85	26.15	34.00
15.	Jamuria-II	6	4.00	3	3	6	2.45	2.60	5.05
16.	Hirapur	1	3.00	*	*	*	*	*	*
17.	Baraboni	13	15.45	4	5	9	7.70	3.45	11.15
18.	Kurti	5	3.70	*	2	2	*	1.00	1.00
19.	Salanpur	8	2.49	3	*	3	1.30	*	1.30
20.	Raniganj	*	*	1	*	1	0.40	*	0.40
21.	Kankea	37	27.30	5	5	10	4.15	3.70	7.85
22.	Durgapur	40	22.10	1	4	5	0.32	2.20	2.52
23.	Andal	64	23.85	1	60	61	0.30	22.30	22.60
24.	Kalna-I	6	10.35	4	1*	4	3.10	*	3.10
25.	Kalna-II	20	8.95	14	10	24	5.00	3.40	8.40
26.	Monteswar	90	58.61	4	27	31	1.52	18.80	20.32/
27.	Purasathali-I	49	24.95	1	12	13	0.40	5.05	5.45
28.	Purasathali-II	45	36.61	6	10	16	3.05	9.75	12.80
29.	Katwa-I	60	38.60	3	28	31	1.50	20.00	21.50
30.	Katwa-II	37	17.37	10	18	28	3.80	7.33	11.13
31.	Ketugram-I	53	28.22	5	20	25	0.52	10.96	11.40
32.	Ketugram-II	33	15.10	3	11	14	1.80	5.60	7.40
33.	Mongolkote	191	86.55	45	87	132	18.00	31.60	49.60
34.	F.F.D.A.	66	54.10	4	41	45	2.85	33.31	36.16
35.	C.A.D.C.	10	3.35	*	7	7	*	2.15	2.15
	Total :	2098	1328.52	212	1095	1307	109.02	656.77	765.79

ANNEXURE-VIIA

F.F.D.A BURDWAN PROGRESS REPORT OF SPONSORING AND SANCTION OF I.F.P. LOAN CLASS (BANK-WISE) FOR THE PERIOD FROM 1.4.86 to 31.1.87

Sl. No.	Name of the Bank	No. of cases sponsored	Water area (in ha.)	No. of cases sanctioned: Spill over	No. of cases sanctioned: Current cases	No. of cases sanctioned: Total	Water area (in ha.): Spill over	Water area (in ha.): Current	Water area (in ha.): Total
1.	S.B.I.	398	286.91	43	240	283	23.75	171.55	195.30
2	B.G.B	805	469.42	19	435	454	9.24	217.06	226.30
3.	U.B.I	63	43.78	2	31	33	1.00	15.85	16.85
4.	U.Co.	221	145.30	20	110	130	7.48	70.18	77.66
5.	U.I.B.	65	40.72	4	35	39	1.45	22.16	23.62
6.	L.D.B.	26	15.30	18	2	20	16.49	0.45	16.94
7.	B.O.I.	119	75.95	15	73	88	8.14	46.08	54.22
8.	C.B.I.	79	61.19	18	25	43	11.85	21.80	33.65
9.	A.B.	37	16.50	2	17	19	0.72	8.95	9.67
10.	N.B.T.	12	5.97	*	*	*	*	*	*
11.	P.N.B.	19	13.27	*	11	11	*	9.13	9.13
12.	Andhra	20	9.50	*	*	*	*	*	*
13.	Union	57	27.01	35	28	63	11.22	14.80	26.02
14.	Syndicate	6	3.40	1	*	1	0.60	*	0.60
15.	Canara	44	23.95	13	12	25	5.45	8.85	14.30
16.	B.C.C.B.	2	6.60	*	*	*	*	*	*
17.	B.O.B.	20	10.70	1	*	1	0.70	*	*
18.	Oriented	8	2.80	*	*	*	0	*	*
19.	Indian	97	70.23	21	76	97	10.92	49.91	60.83
	Total	2098	1328.52	212	1095	1307	109.02	656.77	765.79

Chief Executive Officer,
F.F.D.A. Burdwan.

INDIA

INLAND FISHERIES PROJECT **ANNEXURE-VIII**

25 Ha Hatchery Complex
Estimated Base Cost as of January 1979

CIVIL WORKS	LOCAL	FOREIGN	TOTAL COST	US$'000 EQUIVALENT
Site preparation 1/	121	-	121	14.1
Earthworks 2/	679	-	679	79.0
Clay Soil 3/	174	-	174	20.2
Bank protection 4/	116	-	116	13.5
Pitching Central channel 5/	192	-	192	22.4
Site finishing 6/	247	-	247	28.7
Surfacing of Hatchery Roads 7/	208	-	208	24.2
Watergates 8/	374	12	383	44.9
Hatchery Building 9/	90	4	94	10.9
Water Supply 10/	390	3	393	45.7
Administrative Bldg. 11/	48	2	50	5.8
Staff Quarters 12/	171	7	178	20.7
Storage Building 13/	119	5	124	14.4
Fencing and Gates 14/	64	3	67	7.8
Electricity Supply 15/	65	-	65	7.6
Engineering (10%)	309	-	309	35.9
Subtotal Civil Works	3,367	36	3,403	395.7
EQUIPMENT				
Light duty track 16/	15	1	16	1.9
Pick - up truck 17/	55	5	60	7.0
Jeep 18/	59	6	65	7.6
Trailer for Jeep	4	0	4	0.5
Portable water pumps (2)19/	-	74	74	8.6
Hatching Nets 20/	1	-	1	0.11
Office Furniture	9	-	9	1.0
Miscellaneous 21/	2	-	2	0.2
Subtotal Equipment	145	86	231	26.9
BASE COST ESTIMATE				
Civil Works	3,367	36	3,403	395.7
Equipment	145	86	231	26.9
Land (27 ha)	330	-	330	38.4
Total Base Cost	3,842	122	3,964	460.9
Physical Contingencies 22/	674	7	681	79.2
Total with Contingencies	4,516	129	4,645	540.1

1. Stripping of vegetation and levelling, 301,430m ^{2} at Rs. 0.4/m^2.

2. Excavation for cut-off walls, ponds and bund formation, 126,796m^3 at Rs. 5.4m^3.

3. Delivered at site, used bund construction; 11,173m^3 at Rs.15.6m^3.

4. 13,333 m at Rs. 8.7/m.

5. 4,803 m^2 at Rs. 40/m^2.

6. Trimming pond bottoms, establishment of grass area above water level trimming channel beds, 338, 254m^2.

7. Stone metal surface, 2.5 m wide, 5,956m^2 at Rs. 35/m^2.

8. Subsidiary gates and division boxes.
9. Building includes utilities and tanks, 116m^2 at Rs.810/m^2.

10. There large tubewells, 25 l/sec, capacity with storage tank and pipework for Madhya pradesh, additional cost would be Rs. 340,000 for lined channel of 3 km length with 3 cause capacity.

11. Includes utilities; 65m^2 at Rs. 775/m^2.

12. Includes utilities; 230m^2 at Rs. 775/m^2.

13. Includes utilities; 250m^2 at Rs. 995/m^2.

14. 2,436 m of fencing at Rs. 26/m and 1 pair of gates at Rs. 3,100/pair.

15. Electricity connection fee and distribution system.

16. One 3-wheel truck.

17. One 3-ton diesel truck.

18. One 4-wheel drive diesel engine jeep.

19. Two 7.5 hp low-life turbine pumps 1 cause capacity delivered for Rs. 37,000/- each.

20. Seventy hatching nets.

21. Includes 10 shovels for Rs. 250, 4 box nets for Rs.200, 2 drag nets for Rs. 900 and 1 gill net for Rs.900.

22. Estimated at 20% of civil works.

ANNEXURE - VIII(A) INDIA INLAND FISHERIES PROJECT

25 ha Carp Hatchery Model   Financial Rate of Return 1/(Rs.)

	1	2	3	4	Year 5	6-7	8	9-10	15
I. Revenue									
Sale of 5mm fingerlings 2/			1,147,500	1,721,750	2,295,000	2,295,000	2,295,000	2,295,000	2,295,000
II. Operating Costs						-	-	-	-
Blood Stock 3/			18,750	7,500	3,250				
Cow bung 4			7,500	10,000	12,500	15,000	15,000	15,000	15,000
Superphosphate 5/			1,500	2,250	3,000	3,000	3,000	3,000	3,000
Mahua Oil Cake 6/			2,500	3,750	5,000	5,000	5,000	5,000	5,000
Mustard Oil Cake 7/			4,000	5,000	7,000	8,000	8,000	8,000	8,000
Rice Bran 8/			7,500	8,250	9,150	11,250	11,250	11,250	11,250
Wheat 9/			1,500	2,100	2,400	3,000	3,000	3,000	3,000
Wheat Flour 10/			1,880	2,630	3,000	3,800	3,800	3,800	3,800
Shipping Bags 11/			4,000	6,000	7,000	8,000	8,000	8,000	8,000
Light Duty Truck 12/			2,040	2,270	2,900	2,920	2,920	2,920	2,920
Jeep 13/			8,300	9,060	12,700	12,700	12,700	12,700	12,700
Pick-up Truck 14/			5,200	6,660	8,040	8,040	8,040	8,040	8,040
Portable pump (7.5hp) 15/			9,900	12,380	17,070	17,070	17,070	17,070	17,070
Tubewell Pump 16/			13,500	14,300	31,350	31,350	31,350	31,350	31,350
Earthwork /Repair 17/			26,100	26,100	26,100	900	900	900	900
Nets and Hand Tools 18/			900	900	900	900	900	900	900
Management, Staff & Labour 19/			72,240	144,480	144,480	144,480	144,480	144,480	144,480
Travel			9,000	13,500	18,000	18,000	18,000	18,000	18,000
Miscellaneous			4,000	4,000	4,750	4,750	4,750	4,750	4,750
Interest on Working Capital 20/			17,200	23,109	26170	26,170	26,170	26,170	26,170
Subtotal			2,17,510	304,239	345,230	349,530	349,530	349,530	349,530
Investment Cost 21/	594,600	3,171,200	198,200	-	-	-	121,800	-	(1,770,400)
Total Costs	594,600	3,171,200	415,710	304,239	345,230	349,530	471,330	349,530	(1,429,870)

III. Net Benefits (594,600) (3,171,200) 731,790 1417,011 1,949,770 1,945,470 1,823,670 1,945,470 3,715,870

IV. Financial Rate of Retain 37% (without physical contingencies) 32% (with physical contingencies)

1/ Based on January 1979 prices.
2/ Production at full development (Year 5) is expected to be 27 million fingerlings sold at Rs. 85/1000. Production in year 3 and 4 is assumed to be 50% and 75%, respectively, of full development production.
3/ 2.5 tons of Rs. 7,500/ton. Brood stock would be produced totally by the hatchery after the third year of operation (year 5)
4/ Rs. 60/ton: 250 tons annually at full development.
5/ Rs. 600/tons, 5 tons annually at full development.

6/ Rs. 1,000/ton, 5 tons annually at full development.
7/ Rs. 1,600/ton; 5 tons annually at full development.
8/ Rs. 750/ton, 15 tons annually at full development.
9/ Rs. 1,200/ton, 2.5 tons annually at full development.
10/ Rs. 1,500/ton, 2.5 tons annually at full development.

11/ Rs. 8/ dozen; 12,000 annually at full development.
12/ Rs. 0.1135/km for operating and maintenance, 25,700 km annually at full development.
13/ Rs. 0.453/km for operating and maintenance; 28,000 km annually full development.
14/ Rs. 0.333/km for operating and maintenance; 24000 km. annually at full development.
15/ Rs. 4.95/hour for operating and maintenance; 3,500 hours annually at full development.

16/ Rs. 0.0447/m^3 of water; 700,000 m^3 of water annually at full development.
17/ 1.5% of total earthworks costs.
18/ 25% of total cost of nets and hand tools.
19/ Hatchery staffing plan based on the following:
20/ Interest at 14% annually, average working capital estimated at Rs.122,854 in year 3; Rs. 165,063 in year 5; Rs. 185,857 in years 5; and Rs. 186,929 thereafter.

21/ Investment costs detailed in Annex.2, Table 4. Portable pumps and vehicles would be replaced in year 8, when residual value of the initial equipment is estimated at 40% of original costs. Salvage value in year 15 is estimated at Rs. 1,901,500 for land and civil works and Rs. 18,900 for equipment.

Position	Posts	Salary(Rs.)	40% Benefits(Rs.)
Hatchery Manager	1	16,800	23,520
Asst. Hatchery Manager	1	10,200	14,280
Field Supervisor	1	9,000	12,600
Technician	10	4,200	58,800
Supper Staff	5	3,360	23,520
Salesman	1	.8,400	11,760
Total	19	5,430	144,480

REMARKS

As the Hatchery Manager may face unforeseen situations in different stage of production; he should be allowed some flexibility in the use of different inputs as per items mentioned in the above table on working capital expenses. The expenditure for certain items, in such circumstances, may exceed the amount earmarked in the above estimates while for other items the expenditure may be below the limit prescribed. Such variations may be allowed provided the total expenditure is kept within the limits of estimated total working capital requirement.

ANNEXURE IX
WORKING CAPITAL REQUIREMENT FOR JAMUNAADEGHI HATCHERY

(25ha) (Revised Estimates)

S.No.	Items	Quty.	Rate Rs.	Total Rs.	1985-86 Rs.	1986-87 Rs.
1.	2.	3.	4.	5.	6.	7.
1.	Brood Stock	4.5/MT	34000/MT	153000	1,53,000	Nil
2.	Lime	12.5/MT	1000/MT	12500	2,800	12,500
3.	Cow dung	250/MT	80/MT	20000	10,400	20,000
4.	Superphosphate	2.5/MT	1650/MT	4125	500	4,125
5.	Mouha oil cake	25/MT	1000/MT	25000	19,250	25,000
6.	Urea	2.5/MT	2500/MT	6250	600	6,250
7.	Mustard oil cake	10/MT	2000/MT	20000	10,000	20,000
8.	Rice bran	10/MT	800/MT	8000	5,250	8,000
9.	Wheat bran	2.5/MT	1200/MT	3000	-	3,000
10.	Shipping bag Oxygen cylinder			30000	5,000	30,000
11.	Light duty Truck	500/1000KM	2000KM	10000	5,000	10,000
12.	Jeep	24,000KM	do	12000	5,000	12,000
13.	Portable pump	4000hrs.	6/hrs.	24000	5,000	24,000
14.	Maintenance of vehicle	1500/Month		18000	5,000	18,000
15.	Tube -well pump			30000	10,000	30,000
16.	Earth work repair etc.			20000	-	20,000
17.	Nets & accessories			20000	5,000	20,000
18.	Pituitary gland	9000ns.	2500/ thousand	2500	5,000	22,500
19.	Miscellaneous			22200	10,000	22,500
20.	Cost of hatchery	100ns.	250net	25000	-	25,000
21.	Purchase of spawn (if necessary)		Cost of spawn may be adjusted from the head brood fish if exigencies arise.			
			Total	4,85,575	2,56,800	3,32,975

STAFF COST AND OFFICE CONTINGENCIES

1.	2.	3.	4.	5.	6.	7.
22.	Staff Cost (Pay + Allowances and Labour Change)			2,97,625	1,60,000	2,97,625
23.	T.A. for Staff			15,000	10,000	15,000
24.	Office Contingencies (electric, Telephone)			25,000	20,000	25,000
	GRAND TOTAL:			8,23,200	4,46,800	6,70,000

ANNEXURE-IX (A)

REPAYMENT SCHEDULE FOR JAMUHADEGHI HATCHERY

(Rs. in lakhs)

Years	Income	Expenditure other than covered by bank loan	Surplus	Bank Loan	Loan Repayment	Balance	Interest on 12.5%	Total outgo
1982-83	-	-	-	-	-	17.32	-	-
1983-84	9.72	-	9.72	24.25	-	41.57	6.40	6.40
1984-85	22.68	-	22.68	14.76	1.33	55.00	7.04	8.37
1985-86	32.40	6.84	25.52	-	5.50	49.50	6.88	12.30
1986-87	32.40	6.68	25.72	-	5.50	44.00	6.19	11.59
1987-88	32.40	6.68	25.72	-	5.50	38.50	5.50	11.00
1988-89	32.40	6.68	25.72	-	5.50	33.00	4.81	10.31
1989-90	32.40	6.68	25.72	-	5.50	27.50	4.13	9.63
1990-91	32.40	6.68	25.72	-	5.50	22.50	3.44	8.94
1991-92	32.40	6.68	25.72	-	5.50	16.50	2.75	8.25
1992-93	32.40	6.68	25.72	-	5.50	11.00	2.56	7.56
1993-94	32.40	6.68	25.72	-	5.50	5.50	1.38	6.88
1994-95	32.40	6.68	25.72	-	5.50	-	0.18	6.18

Note : Interest for the year 1982-83 will be paid during the year 1983-84 together with the interest due for that year.

ANNEXURE IX B

Year	1982-83	1983-84	1984-85	1985-86	1986-87 to 1996-97
A. Income	-	9.72	22.68	32.40	32.40
B. Expenditure					
a)Capital	24.74	30.63	15.58	-	-
b)Recurring	-	4.02	5.50	6.84	6.68
Total of B	24.74	34.65	21.08	6.84	6.68
C. Net Income (A-B)	24.74	24.93	1.6	25.56	25.72
Df at 15%	.870	.756	.658	.572	2.292
PW of '(A)'benefit	-	7.34832	14.92344	18.5328	96.94080
PW of (B) cost	21.52380	26.19540	13.87064	3.91240	19.98656

NPW = 51.88645 Benefit Cost Ratio = $\frac{137.74536}{85.85888}$ = 1.51

Df at 30%	.769	.592	.455	.350	1.102
PW of 'C'	(19.02506)	(14.75856)	0.72800	8.94600	28.34344
Df at 35%	.741	.549	.406	.301	.828
PW of 'C'	(18.33234)	(13.68657)	0.64960	7.69359	21.29616

$$IRR = 30 + 5 \times \frac{4.20382}{6.58341} = 33\%.$$

ANNEXURE - X

INDIAN INLAND FISHERIES PROJECT

Cash Flow Projections

Fish Farm Model A (1Ha)

	Without Project	With Project Year 0	Year 1	Year 2	Year 3-7	Year 8-10
I. Cash Inflow						
Gross sales 2/ (1)	175	893	1,800	2,700	3,200	3,200
Loan Amount 3/		893	499			
Borrower's contribution		47	26			
Total Inflow (2)	175	940	2,325	2,700	3,200	3,200
II. CASH OUTFLOW						
Operating Costs						
Fingerlings 4/	0		225	225	225	225
Mahua Oil Cake 6/	0		225	225	225	225
Cow dung 5/	0		300	300	300	300
Lease	0		450	450	450	450
Pond preparation 7/	50		200	200	200	200
Maintenance of equipment 8/	0		320	320	320	320
Operator's wage 9/	0		190	190	190	190
Harvesting 10/	0		108	108	108	108
Interest on working capital 11/	12		18	18	18	18
Total	0		128	122	122	122
	62		1,809	1,933	1,933	1,933
Operating Cost (3)						
Investment Cost						
Earthwork 12/		480				
Inlet and outlet 13/		260				
Fish pond equipment 14/		200				
Investment Cost Total (4)		940	94	324	324	324
Debt Service 15/						
Total outflow(5)	62	940	1,905	2,257	2,257	1,933
III. NET CASH FLOW (2) - (5)	113	0	420	443	943	1,267
IV. FINANCIAL BENEFITS COSTS						
Benefits (1) (6)	175	0	1,800	2,700	3,200	3,200
Costs (3) + (4) (7)	62	940	1,809	1,933	1,933	1,933
Net Benefits (8)	113	(940)	(9)	767	1,267	1,267
Incremental Net Benefits		(1,053)	(122)	654	1,154	1,154

V. FINANCIAL RATE OF RETURN:16/ 55%

1/ Fish pond improvements are assumed to be carried out at the beginning of year, 1, or for cash flow purposes at the end of the previous year (year 0).

2/ Based on without project yields of 100 kg/ha of low quality, mixed fish at an average pondside price of Rs. 1.75/kg. and full development yield of 800 kg/ha for high quality carp at an average pondside price of Rs.4.00/kg; yields in year 1 and 2 are assumed respectively to be 50% and 80% of full development yields.

3/ Loan is assumed to cover 95% of fish pond improvement costs and first year cash inputs (fingerlings mahua oilcake and chemical fertilizers) in year 0 & 1 respectively. Percentage loan coverage under standard ARDC terms would range from 95% depending on borrower's income; loan coverage of selected borrower's receiving an FFDA subsidy could be as low as 75% depending on size of subsidy.

4/ Stocking rate of 2,500 fingerlings/ha at Rs. 90/1,000 fingerlings.

5/ 300 Kgs at Rs. 1/kg.

6/ 5.5 tons/ha in year 1 and 7.5 tons/ha thereafter at Rs. 60/ton.

7/ Dewatering of pond and repairing of dikes.

8/ Maintenance of hand tools, nets and bamboo screens.

9/ Eighteen mandays at Rs. 6/manday.

10/ Two mandays without project and three mandays with project at Rs. 6/manday.

11/ Interest at 14%annually; average annual working capital estimated at Rs.840 in year 1 and at Rs.869 thereafter.

12/ Deepening of pond and strengthening of dikes, 400m^3 at Rs. 2/m^3.

13/ Bamboo screens at Rs. 130/set.

14/ Hand tools and nets at Rs. 200/set.

15/ In year 1 interest only; principal and interest amortized over year 7. Interest rate is 10.5% annually.

16/ For 0.5 ha model, rate of return would be 25%.

ANNEXURE X (A)

INDIA INLAND FISHERIES PROJECT

Cash Flow Projections
Fish Farm Model B (1 Ha) (Rs.)

	Without Project	..................With Year0 1/	Year 1	project.......... Year2	Year3-7	Year 8-10
I. CASH INFLOW						
Gross Sales 2/ (1)	795		3,600	5,400	6,000	6,000
Loan amount 3/		2,633	752			
Borrower's Contribution		139	40			
	795	2,772	4,392	5,400	6,000	6,000
II. CASH OUTFLOW						
Operating Costs						
Fingerlings 4/	50		342	342	342	342
Mahua Oil Cake 5/	0		300	300	300	300
Cow Dung 6/	150		450	600	600	600
Superphosphate 7/	0		150	150	150	150
RiceBran 8/	0		620	750	750	750
Lease	200		500	500	500	500
Pond preparation	0		338	338	338	338
Maintenance of Equipment 10/	25		405	405	405	405
Operator's wages 11/	108		108	108	108	108
Harvesting 12/	18		30	30	30	30
Interest on Working capital 13/	28		204	239	239	239
	579		3,447	3,762	3,762	3,762
Total Operating Cost (3)						
Investment Costs						
Earthwork 14/		1,662				
Inlet and Outlet 15/		260				
Fish pond equipment 16/		850				
Investment Cost Total (4)		2,772				
Debt Service 17/			277	789	789	
Total Outflow (5)	579	2,272	3,724	4,551	4,551	3,762
	216	0	668	849	1,449	2,238
III. NET CASH FLOW: (2) - (5)						
IV. FINANCIAL BENEFITS/COSTS						
Benefits (1) (6)	795	0	3,600	5,400	6,000	6,000
Costs (3) + (4) (7)	579	2,772	3,447	3,762	3,762	3,762
Net Profits	216	(2,772)	153	1,638	2,238	2,238
Incremental Net Benefit		(2,988)	(63)	1,422	2,022	2,022

V. FINANCIAL RATE OF RETURN : 18/ 41%

1/ Fish pond improvements are assumed to be carried out at the beginning of year, 1, or for cash flow purposes at the end of the previous year (year 0).

2/ Based on without project yields of 300 kgs/ of which 60% would be low quality mixed fish at an average pondside price of Rs. 1.75/kg. and 40% major carp at an average pondside price of Rs. 4/kg. Yields at project full development are expected to 1,500 kgs/ha at an average pondside price of Rs. 4/kg. Yields in years 1 and 2 are issued respectively to be 60% and 90% of full development yields.

3/ Loan is assumed to cover 95% of fish pond improvement costs and first year case inputs (fingerlings mhua oil cake and chemical, fertilizers) in years 0 and 1 respectively. Percentage loan coverage under standard ARDC terms would range from 85% to 95% depending on borrower's income; loan coverage for selected borrowers receiving an FFDA subsidy could be as low as 75% depending on size of subsidy.

4/ Without project, pond is stocked with revering fingerlings at rate of 500 fingerlings ha at Rs. 100/1,000. With project, pond is stocked with project fingerlings at rate of 3,000 fingerlings/ha at Rs. 90/1,000.

5/ 300 kgs at Rs. 1/kg.

6/ 2.5 tons without the project, 7.5 tons in year 1 and 10 tons thereafter at Rs. 60 tons.

7/ Two hundred and fifty kgs at Rs. 0.6/kg.
8/ 0.82 tons in year 1,1 ton thereafter at Rs. 750/ton.

9/ Dewatering of pond and repairing of disks.

10/ Maintenance of hand tools, nets and bamboo screens.

11/ Eighteen mandays without the project and five mandays with the project at Rs. 6/manday.

12/ Three mandays without the project and five mandays with the project at Rs. 6/manday.

13/ Interest at 14% annually; average annual working capital estimated at Rs. 1,445 in year 1 and Rs. 1,710 thereafter.

14/ Depending of pond and strengthening of dikes; $1,000m^3$ at Rs.2/m ^{3}.

15/ Bamboo screens at Rs. 130/set.

16/ Hand tools are nets at Rs.850/set.

17/ In year 1 interest only; principal and interest amortized over years 2 through 7. Interest rate is 10.5% annually.
18/ For 0.5 ha mod 1, rate of return would be 25%.

INDIA INLAND FISHERIES PROJECT ANNEXURE-X(B)

Cash Flow Projections
Fish Farm Model C (1 Ha) (Rs.)

	Without Project	With project				
		Year 0 1/	Year 1	Year 2	Year 3-7	Year 8.10
I. CASH INFLOW						
Gross Sales 2/(1)	1,860	0	7,500	9,000	10,000	10,000
Loan amount 3/		5,892	969			
Borrower's Contribution		310				
Total Inflow (2)	1,860	6,202	8,520	9,000	10,000	10,000
II. CASH OUTFLOW						
Operating Costs						
Fingerlings 4/	100		450	450	450	450
Mahua oil cake 5/	0		400	400	400	400
Cow dung 6/	300		620	750	750	750
Superphosphate 7/	0		170	225	225	225
Rice bran 8/	0		1700	2250	2250	2250
Lease	500		1200	1200	1200	1200
Pond Preparation 9/	30		338	338	338	338
Maintenance of equipment 10/	25		509	509	509	509
Operator's wages 11/	312		312	312	312	312
Harvesting 12/	30		48	48	48	48
Interest on working capital 13/	56		335	438	437	438
Total Operating Costs (3)	1,353		6,082	6,920	6,920	6,920
Investment Cost						
Earth work 14/		4,662				
Inlet and outlet 15/		240				
Fish pond equipment 16/		1,200				
Investment Cost Total (4)		6,202				
Debt Service 17/			619	1,599	1,599	
Total outflow (5)	1,353	6,202	6,701	8,519	8,519	6,920
III. Net Cash Flow:						
(2) - (5)	507	0	1,819	481	1,481	3,080
IV. FINANCIAL BENEFITS/ COST						
Benefit(1) (6)	1,860	0	7,500	9,000	10,000	10,000
Cost (3) + (4) (7)	1,553	6,202	6,082	6,920	6,920	6,920
Net benefit(6)-(7)	507	(6,202)	1,418	2,080	3,080	3,080
Incremental Net Benefit		(6,709)	911	1,573	2,573	2,573

V. FINANCIAL RATE OF RETURN: 18/ 27%

1/ Fish pond improvement are assumed to be carried out at the beginning of year 1, or for each flow purposes at the previous year (year 0)

2/ Based on without project yield of 600/kgs/ha of which 40% would be low quality mixed fish at an average pondside price of Rs. 1,75/kg and 60% major carp at an average pondside price of Rs.4/kg. Yields at project full development are expected to be 2,500 kgs/ha at an average pondside price of Rs.4/kg. Yield in year 1 and 2 assumed respectively to be 75% and 90% of full development yields.

3/ Loan is assumed to cover 95% of fish pond improvement costs and first year cash inputs (fingerlings, mahua oil cake and chemical fertilizers) in year 0 and 1 respectively. Percentage of coverage for selected borrowers receiving an FFDA subsidy could be as low as 75% depending on size of subsidy.

4/ Without project, pond is stocked with riverain fingerlings at rate of 1,000 fingerlings/ha at Rs. 100/1,000. With project, pond is stocked with project fingerlings at rate of 5,000 fingerlings/ha at Rs. 90/1,000.

5/ 400 kgs at Rs. 1/kg.

6/ Five tons/ha without the project, 10.3 tons/ha in year 1 and 12.5 tons thereafter ar Rs. 60/tons.

7/ Two hundred and eight-three kgs in year 1,375 kgs thereafter at Rs. 0.6/kg.

8/ 2.27 tons in year 1 and 3 tons thereafter at Rs. 750/tons.

9/ Five mandays of labor without the project. Dewatering and levelling of pond bottom and repairing of dikes with the project.

10/ Maintenance of hand tools, nets and bamboo screens.

11/ Fifty-two mandays at Rs. 6/manday.

12/ Five mandays without the project and eight mandays with the project at Rs. 6/manday.

13/ Interest at 14% annually; average annual working capital estimated at Rs. 2,395 in year 1 and Rs. 3,130 thereafter.

14/ Deepening of pond and strengthening of dikes; 2,500 m^3/ha at Rs. 2/m^3.

15/ Bamboo screens at Rs. 170/set.

16/ Hand tools and nets at Rs. 1,200/set.

17/ In year 1 interest only; principal and interest amortized over years 2 through 7. Interest rates is 10.5% annually.

18/ For 0.5 ha model, rate of return would be 20%.

A REPORT ON OIL SEEDS PROJECT OF OILFED, BHOPAL.

- S. SAROJA AND SANTOSH KUMAR

INTRODUCTION

Oilseeds crops occupy a premier position in the National Economy, as oils extracted from oilseeds not only form an essential part of human diet but are also important raw material for the manufacture of soaps, paints and varnishes, hairoils, lubricants, textile auxiliaries and various other sophisticated products. Oilcakes are used as cattlefeed and manure. Oilseeds and their products are, therefore, valuable foreign exchange earner also. In addition, 2.5 million persons are engaged in milling and processing of oilseeds and oils.

With the commercial production deemed to have started around 1970, Soyabean, a leguminous crop, is a relatively new entrant into the Indian oilseed scene. Although cultivation of the crop is being developed in the regions where the agro-climatic conditions are favourable for the crop and where production of the crop does not interface with other established crops, only these states viz. Madhya Pradesh, Uttar Pradesh and Rajasthan are having promises and potentiality for Soyabean.

Soyabean has now, come to occupy a place in the India oilseed economy and this trend, triggered off, is likely to continue in the years ahead as:-

a. Huge potential for cultivation in the large areas of available fallow lands.

b. It is being a relatively easy to grow crop.

c. The Governmental policies designed to provide a support to the growers through price support mechanism.

Recognising the importance of soyabean in bridging the gap between demand and supply of edible oil on one hand and protein on the other, the NCDC is assisting a soybean development project in the States of Madhya Pradesh and Uttar Pradesh. This project is aimed at creation of Co-operative soyabean processing Capacity of 0.15 million tonnes per annum - 0.12 million tonnes for in Madhya Pradesh and 0.03 million tonnes in Uttar Pradesh. Looking to the further potential of Soyabean, corporation formulated another follow up project for implementation in the states of Madhya Pradesh and Rajasthan. This project envisages establishment of four soybean processing units (each of 60,000 per annum capacity) two in Madhya Pradesh and two are in Rajasthan. Besides, the soybeans projects also include a component of co-operative development services in the catchment arèa of each processing plant.

This project posed to World Bank as part of NCDC-III for IDA sistance, were appraised by the World Bank mission in the months of tober and November, 1983 and the credit negotiations for the project mpleted in May 1984. The project approved entails a total cost of S. $468.0 million (Rs. 5054.4 million) and an IDA credit of US $220 llion (2376 million)through credit no. 1502.

Soya project as approved by IDA for implementation in the States of jasthan and Madhya Pradesh consists of establishing the following ocessing facilities.

Soy-seed processing plants two in Madhya Pradesh of each of 5 tonnes per hour capacity and in Rajasthan with a through put capacity of 2.5 tonnes per hours.

For Soya-solvent extraction plants of each of 200 tonnes per day or 60,000 tonnes per annum capacity three in Madhya Pradesh and one in Rajasthan.

The M.P. State, Oilseed Growers Federation Ltd. popularly known as LFED, was constituted in October, 1979 with the broad goal of velopment of oilseeds and edible oil production in the State. The deration was formed at the instance of the Government of India and vernment of Madhya Pradesh as the implementing agency for the velopment of Indian Oil Seeds and edible oils industry. On the one nd, Oilfed actively helps growers to improve oilseeds cultivation and sures regular off take of their produce. On the other hand, Oilfed is pidly expanding and diversifying its processing capabilities to bring the consumer good quality edible oils and other products, which was signed to integrate production, procurement processing and marketing co-operative lines. The chart explaining the procedure is shown in nexure - I.

The OILFED headquarters in Bhopal and spread all over Madhya adesh. Oilfed is in the heart of the Soya country. Madhya Pradesh counts for over 80 percent of Soya production in India.

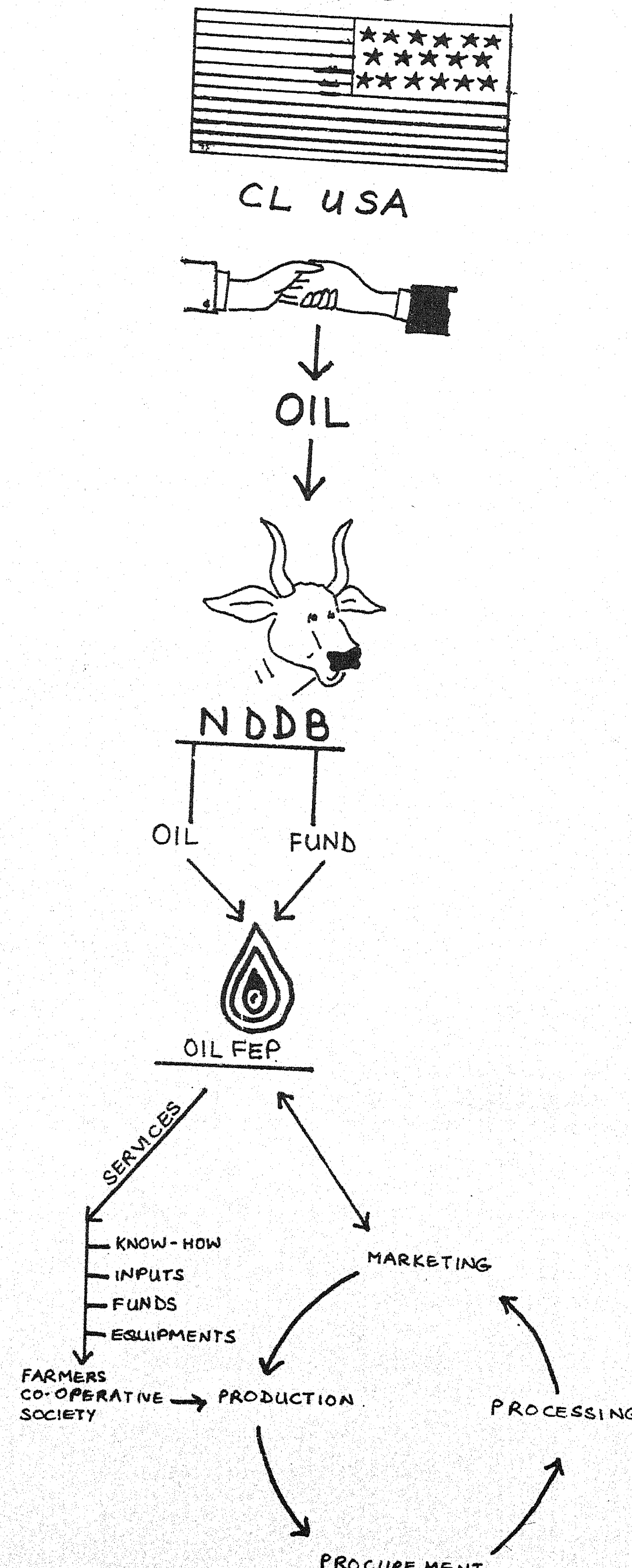
Since its inception, oilfed has taken over the task of energising nascent Soya industry in India.

Soya is an excellent, inexpensive source of protein. It requires s of nitrogen fertilisers and permits double cropping. Besides, Soya ually enriches the soil it grows on, since it is a legume. It is e profitable for the grower than any other Kharif pulse or oilseed.

Oilfed is assuming a leading role in the development of Soya as l as other oilseeds in Madhya Pradesh. And with its enormous, ultra ern processing facilities, Oilfed not only acts as a ready market

ANNEXURE 1

PROCEDURE OF THE FEDERATION



for the growers' produce but also as a source of good quality edible oil to the consumers.

Oilfed has in a nutshell, ushered in a new concept in integrated co-operative efforts in Madhya Pradesh, embracing cultivation, processing and marketing.

The different objectives of this unique Oilseeds Co-operative are multifold:-

1. To organise Co-operatives of Oilseed growers at the village level.

2. To undertake agricultural research and development and its dissemination among the member growers.

3. To impart training to the growers.

4. To ensure a regular offtake of the produce of the Co-operatives.

5. To ensure regular remunerative prices to growers.

6. To develop adequate storage and processing facilities.

7. To arrange effective marketing of the products and by products.

The key to success of oilfed in contributing to the development of oilseeds lies in the depth and range of its efforts at the grower's level.

Creation of Grower's organisation is the most important requirement of the project. The size of the project and plant being established in the project area will depend completely on the organisation of grower's co-operative, their effective management and participation in the project. To achieve financial viability each OSCS should have at Least 500 ha. of land under Soyabean cultivation with an ultimate membership of about 300. Hence the main objective of the project.

1. To organise 400 OSCS in the project Area.

2. Enroll about 1,05,600 Soyabean growers by the end of the 5th year and 1,20,000 by the end of 7th year from about 3,200 villages as members of the Co-operatives.

3. To bring 2,10,000 hectares Soyabean as members holding into the fold of Co-operatives.

4. To ensure remunerative prices of growers.

5. To produce total requirement of Soyabean for the plant.

6. To implement extension programme to increase Soybean production.

7. To organise demonstration-cum-seed multiplication plots at the society level to disseminate the technical know-how and to provide inputs to raise to good quality seed material.

8. To impart necessary training to operating staff of the federation.

9. To undertake all necessary activities and to ensure sound institutional development of this basic level structure.

In 1979, Oilfed started with 1,325 member growers organised into 28 Oilseed Grower's Co-operative Societies. But today, Oilfed has over 78,316 member growers affiliated to as many to as many as 617 primary Co-operatives spread over 17 districts of Madhya Pradesh.

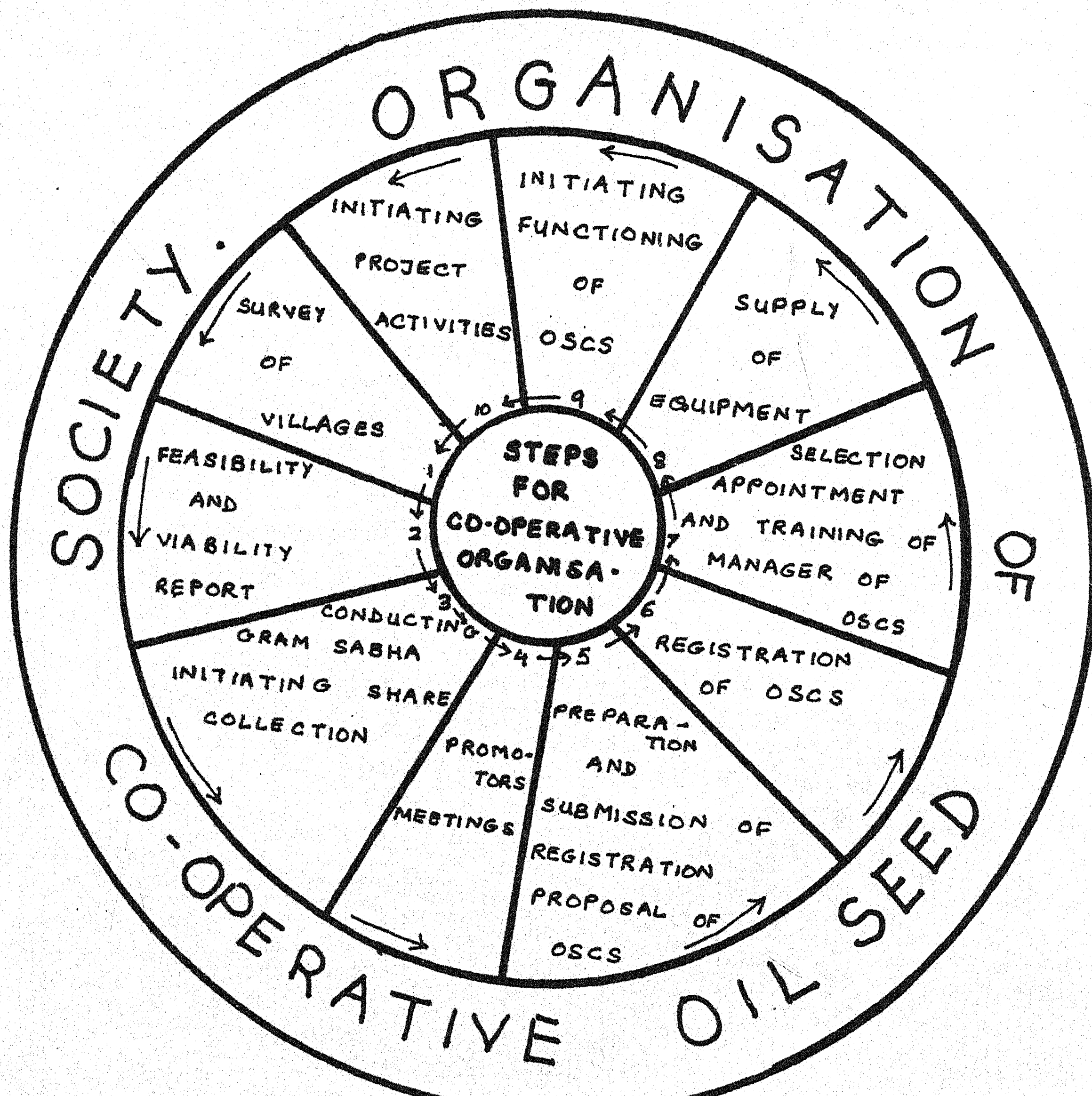
Oilfed's structure is planned on a three tier model; at the base is the village level Co-operative Society which consists of farmer growing Oil seeds (Primarily Soyabean). These Co-operatives are independent units managed by elected Committees of the member growers. A group of six to eight villages, with an area of 500 to 700 hectares, are clustered together to form a primary co-operative, a total of 6000 villages are presently within the oilfed fold. A Union comprising of a group of primary co-operative societies, forms the middle tier. At the apex is oilfed's management manufacturing and marketing structure.

The steps taken to form the co-operative organisation in a chart form is shown in the Annexure 2. Oilfed has a comprehensive support structure cooperating 12,200 districts. The following twenty districts are planned by MP OILFED to be covered under the Project and the districts are grouped into six oilsheds as under.

S.No.	OILSHEDS		Districts
1.	Sehore	1.	Sehore
		2.	Bhopal
		3.	Rajgarh
		4.	Shulpur tehsil
		5.	Vidisha
2.	Ujjain	1.	Indore
		2.	Ujjain
		3.	Pewas
		4.	Shajpur
		5.	Dhar
		6.	Ratlam
3.	Hoshangabad	1.	Hosangabad
		2.	Betal
		3.	Raisen

ANNEXURE II

CO-OPERATIVE ORGANISATION



4.	Chindwara	1.	Chindwara
		2.	Narsinghpur
		3.	Seoni
		4.	Balaghat
		5.	Mondla
		6.	Jabalpur

The consolidated report of the oilfed districts with No. of villages OGCS member etc. as on Nov. 86, Shedwise analysis of co-operative organisation, procurement and production enhancement as on ending July, 1986, Districtwise analysis of procurement, and distributive analysis of procurement are given in Annexure - 3,3(a), 3(b), and 3(c).

Each of these districts have one are co-operative formation officer, to help the growers form and run co-operatives-a new skill to them. The district-wise analysis of cooperative formation and extension activities as on 31st July 1986 is given in Annexure - 4.

One agriculture expert in each district helps growers improve their cultivation methods and encourages the use of better seeds and plant protection by 130 extension assistants operating at primary society level, supervised by 27 area supervisors. Other services are also available; for eg., The organisation chart of a district office is given in Annexure - 5.

Even the vulnerability to climatic vagaries is minimised by diligent cultivation programmes recommended by oilfed's experts, leading to better crop patterns and harvests.

MP OILFED has already taken the procurement of Soyabean produced by its members through OGCS. The price paid to the member growers is based on prevailing market price. The payment is based on quality of seeds supplied by the growers. Proper arrangements are made for transportation of Soyabean from OGCS to godown/plant, during procurements reason to ensure maximum procurement. The activities of the procurement and transportation are controlled by the district under strict supervision. The exercise is ably explained in the chart given in Annexure 5(a).

Oilfed has helped to increase the income of the growers by being instrumental in increasing the area under cultivation as well as raising the relatively low yield levels per hectare.

The average yield per hectare in 1979 was only 800 kgs., while today the members growers have achieved as high a yield as 1100 kgs. The growers are assured of a price equivalent to the mandi price or the support price, whichever is higher.

REPORT OF OILFED DISTRICTS

as on Nov. 86

ANNEXURE III

Name of District	No. of OGCS	No. of Farmer members in OGCS	No. Villages Covered by OGCS	Members Soy./Sarson Area in hectares.
DEWAS	67	13,301	802	33,178.000
UJJAIN	81	12,177	826	42,920.000
INDORE	80	10,961	534	49,307.000
DHAR	57	7,837	382	29,995.000
RATLAM	24	2,696	192	6,357.000
SHAJAPUR	23	2,752	150	9,917.000
SHUJALPUR (TEH)	19	2,553	203	9,878.000
SEHORE	50	6,971	393	31,681.000
RAJGARH	21	2,300	220	7,336.000
BHOPAL	23	2,195	315	8,611.000
RAISEN	32	1,728	382	7,718.000
VIDISHA	23	812	265	4,000.000
HOSHANGABAD	52	6,022	707	23,000.000
BETUL	45	4,615	567	13,268.000
CHHINDWARA	38	2,488	384	2,352.000
SEONI	14	715	128	6,068.000
				SARSON.
BHIND/ MORENA	53	3,314	263	11,515.000
TOTAL	702	83,437	6,713	2,97,095.000

ANNEXURE III (A) SHEDWISE ANALYSIS OF CO-OPERATIVE ORGANISATION PROCUREMENT & PRODUCTION ENHANCEMENT AS ON ENDING JULY-1986

OIL SNO.	PARTICULARS	UJJAIN OIL SHED	SEHORE OIL SHED	HIBAD OIL SHED	CHHINDWARA OIL SHED	BHIND MORENA OIL SHED	TOTAL
A-1 (1)	NUMBER OF SOCIETIES	325	65	137	20	53	600
A-2 (2)	NO OF FARMER MEMBERS	49,594	8,714	13,764	1,887	2,960	76,919
A-3 (3)	NO OF VILLAGES COVERED	2,997	551	1,878	200	263	5,889
A-4 (4)	MEMBER OIL SEED AREA(ha)	1,52,028	37,111	54,841	6,370	11,457	2,61,807
A-5 (5)	TOTAL CUSTIVABLE AREA OF MEMBERS(ha)	2,37,403	65,687	72,753	9,288	25,568	4,10,699
A-6 (6)	AVERAGE MEMBER PER SOCIETY	152.59	134.06	100.46	94.35	55.84	128.19
A-7 (7)	AVERAGE MEMBER PER VILLAGE	16.54	15.81	7.32	9.43	11.25	13.06
A-8 (8)	AVERAGE OIL SEED AREA AREA PER MEMBER (ha)	3.06	4.25	3.98	3.37	3.87	3.40
A-9 (9)	AVERAGE CULTIVABLE AREA PER MEMBER (ha)	4.78	7.53	5.28	3.37	8.63	7.33
B-1 (10)	PROCUREMENT (M.T.)	81,137.8	11,754.3	33,754.9	5,290.3	2,051.424	1,33,988.72
B-2 (11)	AVERAGE PROCUREMENT PRICE PER M.T.	2,760.89	2,738.47	2,613.81	2,716.58	5,041.00	2,755.03
B-3 (12)	AVERAGE TRANSPORTATION COST PER M.T.	70.98	48.71	63.31	111.82	93.20	71.00
B-4 (13)	TOTAL PROCUREMENT COST PER MT (11+12)	2,831.34	2,746.21	2,666.74	2,828.09	5,132.69	2,817.51
B-5 (14)	AVERAGE PROCUREMENT PER SOCIETY (MT)	249.65	180.83	246.38	264.51	39.70	223.31
B-6 (15)	AVERAGE PROCUREMENT PER MEMBERS (MT)	1.63	1.34	2.45	2.80	0.69	1.74
B-7 (16)	AVERAGE PROCUREMENT PER MEMBERS	0.53	0.31	0.61	0.83	0.17	0.51
B-8 (17)	AVERAGE PROCUREMENT PER VILLAGE (MT)	27.07	21.33	17.97	26.45	7.80	22.75
C-1 (18)	SEED DISTRIBUTED (MT)	581.8	92.0	150.28	17.6	1.5	843.18
C-2 (19)	FERTILIZERS DISTRIBUTED (MT)	437.50	76.25	104.1	94.0	NA	711.85
C-3 (20)	THYRUM DISTRIBUTED (PKTS)	11,443.00	2,873.00	7,918.00	358.0	NA	22,592.00
C-4 (21)	CULTURE DISTRIBUTED (PKTS)	14,610.00	2,510.00	7,333.00	208.0	NA	24,661.00
C-5 (22)	SPRAYERS DISTRIBUTED (NOS)	37.00	41.00	53.00	NA	NA	131.00
C-6 (23)	DUSTERS DISTRIBUTED (NOS)	02.00	-	40.00	-	NA	42.00
C-7 (24)	OTHERS DISTRIBUTED (NOS)	-	45.00	07.00	-	NA	52.00
C-8 (25)	DEMONSTRATION PLOT (NOS)	529.00	89.00	216.00	05.0	02.0	841.00
C-9 (26)	AREA (ha)	189.1	35.6	98.91	2.0	1.6	327.21

ANNEXURE III (B) DISTRICTWISE ANALYSIS OF PROCUREMENT AS ON 31st JULY-1986

SNO.	DISTRICT	PROCUREMENT				AVERAGE PROC. PER OGCS	% OF YELLOW TO TOTAL PROCUREMENT	QUALITY - INDICATOR (%)					
								YELLOW SOYABEAN			BLACK SOYABEAN		
		YELLOW	BLACK	SEED	TOTAL			FAQ	GRADE-I	GRADE-II	FAQ	GRADE-I	GRADE-II
1.	INDORE	21223.325	1561.281	449.910	23234.516	318.781	93.28	77.95	18.65	3.40	85.53	12.87	1.60
2.	DEWAS	12027.055	2342.917	457.54	14827.512	224.659	84.19	65.74	27.56	6.50	73.18	23.90	2.92
3.	UJJAIN	20145.703	744.062	360.348	21250.113	275.97	96.49	60.00	34.00	6.00	69,00	28.00	3.00
4.	DHAR/RTM	13547.045	909.015	504.180	14960.240	216.815	93.92	72.284	20.502	7.214	67.407	26.221	6.372
5.	SHAJAPUR	5317.71	1457.897	117.900	6893.507	172.337	78.85	63.43	27.31	9.26	78.58	17.51	3.61
6.	RAJGARH	1297.759	606.017	-	1903.776	118.98	68.16	49.44	37.13	13.43	63.31	30.64	6.23
7.	SEHORE	8616.805	1222.573	11.15	9850.528	201.03	87.52	62.79	28.55	8.64	77.14	19.48	3.37
8.	BHOPAL	3728.104	1155.272	-	4883.376	305.211	76.34	65.1	24.1	10.08	62.6	29.5	7.9
9.	VIDISHA/RSN	2238.377	1302.784	-	3541.161	107.30	63.21	59.14	30.23	10.61	70.13	23.14	6.72
10.	HOSHANGABAD	2806.018	14160.442	41.31	17007.77	327.072	16.74	60.73	26.98	12.29	62.60	29.06	8.34
11.	BETUL	4258.415	3502.901	561.330	8322.646	231.134	57.91	23.82	47.76	31.51	23.82	47.04	29.14
12.	CWD/SEONI	4409.199	847.665	33.48	5290.344	264.51	83.97	35.96	44.23	19.80	35.28	48.69	16.01
13.	BHIND/MORENA	NA	NA	NA	2051.424 (MUSTARD)	38.70	NA	68.47 (MUSTARD)	22.85	8.68	NA	NA	NA
		99615.515	29812.826	2537.148	134016.89	241.253 (SOYABEAN)	77.40 (SOYABEAN)	63.74 (SOYABEAN)	27.80	8.46	61.36 (SOYABEAN)	29.15	9.49

ANNEXURE III (C)

DISTRICTWISE ANALYSIS OF PROCUREMENT AS ON 31st JULY - 1986

SNO.	DISTRICTS	PROCUREMENT AS AVERAGE PROCUREMENT % OF TARGET	ANALYSIS OF SOCIETIES PER VILLAGE	PER MEMB.	AVERAGE BELOW 30% OF TARGET NO.	AS % OF TOTAL NO OF OGCS	30% TO 70% OF TARGET NO	AS % OF TOTAL NO OF OSCS	ABOVE 70% OF TARGET NO	AS % OF TOTAL NO OF OSCS	AVERAGE RATE AREA(MT/ha)	TRANSPORTATION PROC/MEMBERS OILSEED PAID (PMT) YELLOW	BLACK	COST (PMT) (Ad-hoc)
1.	INDORE	133.37	46.562	2.19	5	6.849	7	9.589	61	83.562	0.49	2792	2549	72.03
2.	DEWAS	100.86	18.816	1.13	2	3.03	6	9.09	58	87.88	0.45	2779	2538	45.00
3.	UJJAIN	122.33	26.86	1.84	1	1.29	9	11.68	67	87.03	0.50	2775	2539	52.89
4.	DHAR/RTM	111.97	26.33	1.65	11	15.94	11	15.94	47	68.12	0.46	2781	2534	114.25
5.	SHAJAPUR	67.91	19.63	1.33	6	15.00	10	25.00	24	60.00	0.37	2776	2541	85.44
6.	RAJGARH	63.45	11.60	1.03	2	12.5	5	31.25	9	56.25	0.34	2769	2529	48.7
7.	SEHORE	136.81	25.45	1.45	2	4.08	10	20.40	37	75.52	0.31	2777	2538	-
8.	BHOPAL	162.77	20.78	2.72	-	-	-	-	16	100.00	0.66	2776	2532	-
9.	VIDISHA/RSN	39.34	8.33	2.00	11	33.33	6	18.18	16	48.49	0.42	2721	2480	20.32
10.	HOSHANGABAD	94.22	24.05	2.86	1	1.92	-	-	51	98.08	0.63	2771	2528	49.00
11.	BETUL	79.26	16.28	1.95	-	-	16	44.44	20	55.56	0.67	2736	2498	112.86
12.	CWD/SEONI	88.17	26.45	2.80	1	5.00	3	15.00	16	80.00	0.83	2754	2510	111.82
13.	BHIND/MORENA	20.51	7.80	0.69	45	84.90	6	11.33	2	3.77	0.17	5041	NA	93.20
		SOYABEAN-103.88 MUSTARD-20.51	22.75	1.74	87	14.50	89	14.83	424	70.67	0.51	2776 (SOYABEAN)	2525	71.00

ANNEXURE IV

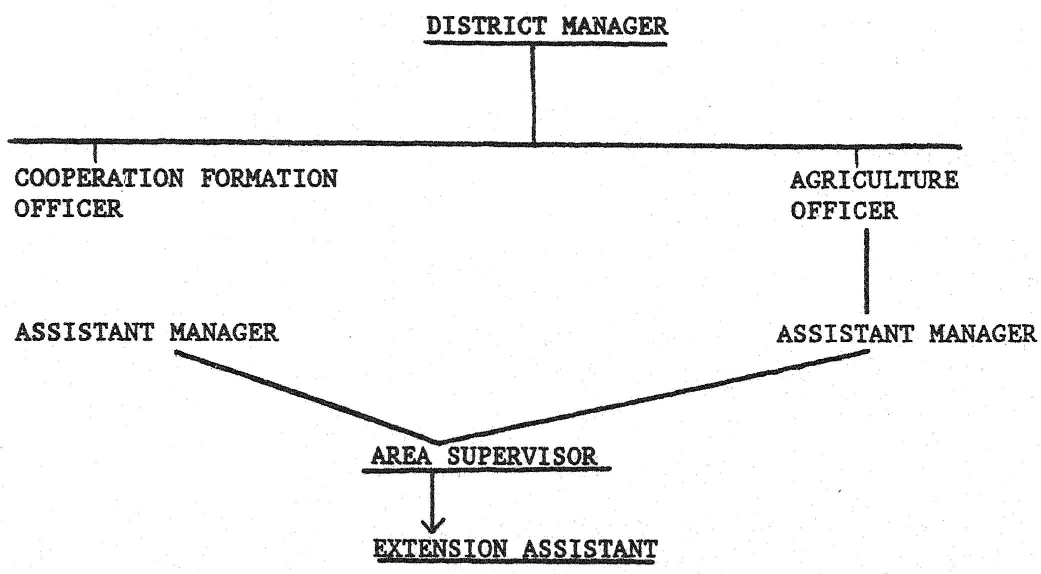
DISTRICTWISE ANALYSIS OF CO-OPERATIVE FORMATION AND EXTENTION ACTIVITIES AS ON 31st JULY-1986

SNO.	DISTRICTS	SOYABEAN/MUSTARD CULTIVABLE AREA OF MEMB (ha)	NO OF DEMONSTR--ATION FIELD	SEED DISTRI--BUTION(MT)	NO OF OSCS	FARMER MEMBERS	VILLAGES COVERED	AVERAGE VILLAGE PER SOCIETY	AVERAGE FORMER PER PER SOCIETY	AVERAGE FARMER PER VILLAGE
1.	INDORE	47060.00	120	137.5	73	10596	499	6.83	145.15	21.23
2.	DEWAS	38384.499	130	247.24	66	13027	788	11.93	197.37	16.53
3.	UJJAIN	42500.000	150	209.36	77	11492	791	10.27	149.24	14.52
4.	DHAR/RATLAM	31887.000	135	125.200	69	9329	568	8.23	131.20	15.93
5.	SHAJAPUR	18257.000	74	52.88	40	5150	351	8.77	128.75	14.67
6.	RAJGARH	5480.400	32	24.32	16	1840	164	10.25	115.00	11.21
7.	SEHORE	31630.027	89	92.00	49	6874	387	7.89	140.28	17.76
8.	BHOPAL	7300.580	45	18.12	16	1790	235	14.68	111.87	7.61
9.	VIDISHA/RAISEN	8253.676	18	3.96	33	1770	425	12.87	53.63	4.16
10.	HOSHANGABAD	26914.68	73	32.00	52	5946	707	13.59	114.34	8.41
11.	BETUL	12371.740	78	72.20	36	4258	511	14.19	118.27	8.33
12.	CHHINDWARA/SEONI	6370.012	5	17.60	20	1887	200	5.55	94.35	9.43
13.	BHIND/MORENA	11457.000 (MUSTARD)	40	1.5	53	2960	263	4.96	55.84	11.25
		281866	989	1033.68	600	76919	5889	9.815	128.19	13.06

ANNEXURE-V

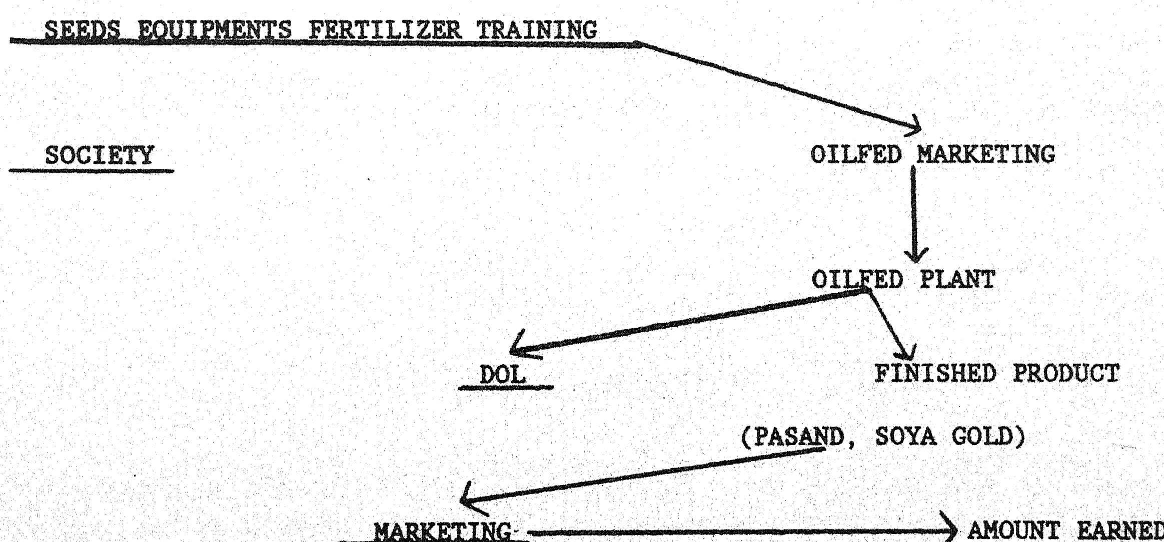
ORGANIZATION CHART (OILFED) DISTRICT OFFICE

M.P OIL FEDERATION DIST. OFFICE ORGANIZATION CHART (EXTENSION)



ANNEXURE-V(A)

PROCUREMENT EXERCISE



STORAGE

With an rapid increase in oilseed cultivation and the extension of processing capacities, oilfed has made provision for substantial increase in storage capacities in plants as well as village locations.

Over 350 godowns of 50-100 MT capacity are under construction at village sites storage capacity at the plant level is also being increased, so that the present requirement of 240,000 MT by the plants can be efficiently handled.

Oilfed's plants are strategically located in different parts of Madhya Pradesh.

MARKETING ACTIVITIES & FUTURE DIVERSIFICATION PROGRAMME

Oil Federation is engaged in marketing activities of selling of deoiledcake solvent extracted soy oil. Refined soya oil etc. and is now preparing for marketing of Vanaspati, TV and soya floor etc. while deoiled cake is almost completely exported, Solvent extracted soya oil is being sent to various vanaspati units located all over the country. However, the Federation plans to diversify its marketing activities and tap others potential markets. The Federation is the near future would be commissioning on Edible oil Refinery at Ujjan and a Vanaspati Plant at Churhat, district Sidhi, both with a capacity of 100 tpd. This would result in release of additional 30,000 tonnes of refined oil and 30,000 tonnes of vanaspati in the market.

For the purpose of marketing of Refined Soyabean oil (RSO), OILFED proposes to use tetrapack packaging which has so far not been tried in India. The packaging range for RSO shall be in tetrapacks, sizes ranging from 500 gms to 1000 gms, PET (poly Ethylene Tetrathalphate), HDPE, for 1 kg., 2kg. and 5 kg. pack sizes. Nylon is also being seriously considered for flexible pouch packing. As a part of the marketing strategy, Federation shall be aiming to convert traditional consumers of Refined Groundnut oil into using Refined Soyabean oil.

Vanaspati shall be sold in conventional packaging with HDPE/LDPE coextruded film being used in 500 gms and 1000 gms pack sizes, HDPE poly containers for 1 kg., 2 kg., and 5 kg. pack sizes and tins for 4 kgs. and 15 kgs. pack sizes.

Since September 1981, oilfed has exported over 150,000 MT Soyameal to several countries in East Europe, the middle east and West Asia, earning the national exchequer our Rs. 330 million in foreign exchange.

Deoiled soya meal has a vast export potential oilfed, with its impressive processing capacities and stringent international quality control standard has found worldwide acceptance for its soya meal.

With the commissioning of its integrated soya complex in Ujjain, oilfed's soya meal production is expected to increase in 1986-87 to over 200,000 MT, valued around Rs. 400 million annually.

Oilfed is also geared to cater to special enquiries for soya meal extractions such as hypoquality, soya-gits and in pelletised form'.

Twenty percent of India's total soya meal export is currently being achieved by oilfed with the increased production, oilfed's exports volume is set production, oilfed's export volume is set for a dramatic growth in future.

The name of the different country are shown in Annexure-6.

MARKETING ANALYSIS REPORT

Till October, 1985 a total of 4,445 tonnes refined rapeseed and refined soyabean oil 52,009 tonnes DOC (Export 40,640 and inland 11,396 tonnes) and 16,833 tonnes raw soya oil have been sold.

MONTH	REFINED OIL SOLD (TONNES)	RAW OIL SOLD (TONNES)
November, 1984) December, 1984) January, 1985)	790	1661
February, 1985	46	1015
March, 1985	520	1177
April 1985	187	1105
May, 1985	140	6176
June,1985	491	1980
July, 1985	601	1245
August, 1985	737	935
September, 1985	356	895
October, 1985	577	633

SEONI-MALWA AND SEHORE

The Soya Solvent extraction facilities at Seoni-Malwa and Sehore, each of 200 TPD capacity, were commissioned at a cost of Rs. 90 million each.

The seoni Malwa Unit went on stream in April 1984. The Sehore plant commenced production in May 1986.

The Sophistication of technology in these plants is born act the fact that the cost of processing per metric tonne of Soyabean is are of the lowest in the Country.

CHURHAT

The 100, TPD vanaspati plant located at Churhat in Sidhi district has been set up at a cost of Rs. 110 million. The plant is the most modern in the country. Trail production has commenced and the sale of oilfed's pasand Vanaspati has already begun.

UJJAIN

Oilfed's Rs. 210 million integrated soya complex in Ujjain is the largest and most Sophisticated Unit of its kind in India. With a 400 TPD Soya Solvent extraction plant, a 100 TPD refinery and a lecithin capacity of 300 kg. a day. There is provision for adding manufacturing facilities for a range of soya products.

In order to efficiently stone and handle its oilseed requirement, this complex has huge storage sites equipped with modern material handling systems, and can store a total of 35000 MT.

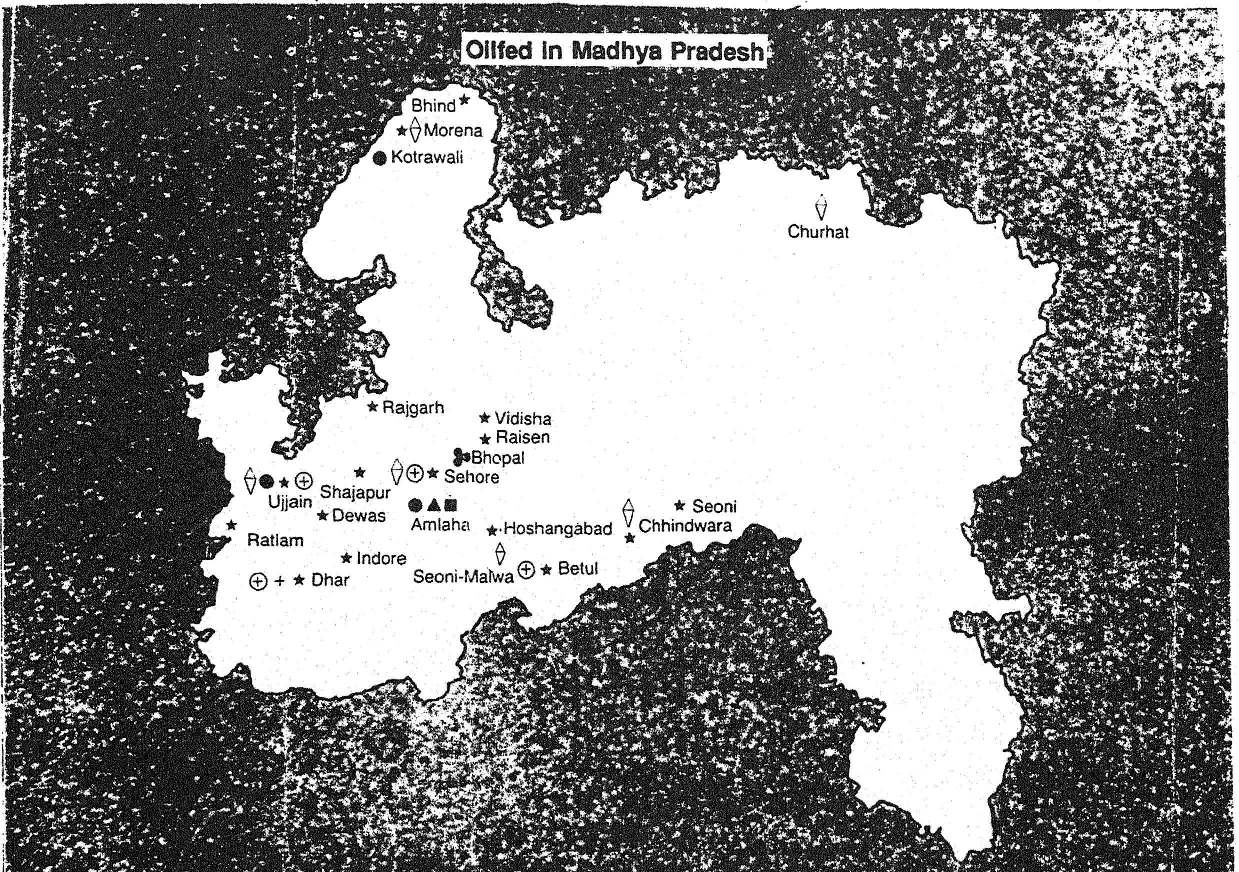
The technological process of oilfed is attested by the fact that oilfed has achieved an outstanding capacity utilisation of over 90 percent as against the industry average of 70 percent. Also, three oilfed's plant were designed and erected by its own team engineers.

The growth record and the different areas of oilfed in Madhya Pradesh, the balance sheet of the federation as on Oct. 1986, tentative trading account for the year ended 31st Oct. 1986, and the tentative profit and loss account are shown in the different annexure Nos 6, Annex-7, Annex-8, Annexure 9(a), and 9(b) respectively.

During our field tour, we visited sehore plant and the OSCS in Sehore district for intensive study. The Sehore Plant has the Soya

GROWTH RECORD OF OILFED, M.P.

Annex. — 6



Growth record

	1980-81	1985-86
Member growers	1,325	78,316
Total area cultivated by members (hectares)	9,275	507,184
Total quantity procured from growers (MT)	5,014	133,989
Total amount disbursed to growers (Rs. crores)	1.4	36.92
Total quantity processed (MT)	3,170	105,000
Exports (Rs. crores)	Nil	16.6
Sales turnover (including exports) (Rs. crores)	8.31	60.0

(SUBJECT TO AUDIT)

LIABILITIES	AMOUNT	AMOUNT	AMOUNT
AUTHORISED SHARE CAPITAL			5,00,00,000.00
PAID UP SHARE CAPITAL			
Govt. of M.P. (NCDC Proj)	13,52,75,000.00		
N.D.D.B.	70,00,000.00		
Oil Seed-Cooperative Socy,	88,05,797.28	151080797.28	15,10,80,797.28
RESERVE & SURPLUS			
I. Capital Grant from NDDB in Cash/kind			
a) Ujjain Plant	4,83,46,800.00		
b) F.T.C. Amlaha	22,89,098.00		
c) Others	62,39,838.46	56875737.46	
II. Capital Grant from Govt. of M.P.			
a) Churhat Plant			
b) Culture Lab. Dhar	54,00,000.00		
c) Others	1,00,000.00	17300000.00	
III. DEPRECIATION & INVESTMENT ALLOWANCE	7,03,95,102.48	70395102.48	
IV. OTHER FUNDS	25,30,826.00	2530826.00	14,71,01,664.94
V. LOANS			
a) Govt. of M.P. (NCDC Project)	14,67,48,638.00		
b) N.D.D.B. (Ujjain Project)	11,28,09,200.00		
c) N.D.D.B. (for Vehicles	2,83,292.14	259841130.14	25,98,41,130.14
VI. CURRENT LIABILITIES AND PROVISIONS			
a) Sundry Creditors	2,11,21,271.73	21121271.73	
b) Deposits	31,97,278.29	3197278.29	
c) Short Term Loans From			
i) N.D.D.B.	1,00,00,000.00		
ii) Govt. of M.P.	1,60,08,000.00		
iii) Bank over Draft	14,10,22,498.71	167030498.71	
d) Provisions	2,22,78,505.42	22278505.42	21,36,27,554.14
	77,16,51,146.51		

ASSETS	AMOUNT	AMOUNT	AMOUNT
FIXED ASSETS			
1. GROSS BLOCK			
a. Head Office	23,40,01,956.92		
b. Ujjain Refinary	3,06,76,000.00		
c. Ujjain Tin Filling	42,55,000.00		
d. d.F.T.C. Amlaha	27,89,098.00	271722054.92	
2. WORKING PROGRESS			
Ujjain Project	12,57,93,439.79	125793439.79	39,75,15,494.71
INVESTMENTS	3,26,100.00	326100000	3,26,100.00
3. CURRENT ASSETS LOANS & ADVANCES			
a) Sundry Debtors	(3,21,39,302.83	32139302.83)	
b) Advances Recoverable in Cash/Kind	(4,86,80,952.55	48680952.55)	
c) Advances for current yrs. purchases	9,44,69,444.91	94469444.91	
d) Advances to Regional Union, Ujjain.	66,33,003.90	6633003.90	
e) Advances to Ujjain Proj. (NDDB)	85,30,275.00	8530275.00	
f) Deposits	6,50,280.30	650280.30	
g) Accrued Income. (NDDB)	50,50,000.00	5050000.00	
h) Branch/District Balances	30,30,188.87	3030183.87	
i) Stock-in-hand	9,75,19,904.06	97519904.06	
j) Cash & Bank Balances			
i) Cash-in-hand	1,24,761.67		
ii) Cheques-in-hand	2,96,60,000.00		
iii) Bank Balances	2,31,71,699.05	52956460.72	34,96,59,808.14
IV. MISC, EXPENSES (To the extent not written off or adjusted) Balance of P & I a/c as per last year's balance sheet.	4,16,21,294.76		
Less profit during the year.	1,74,71,551.10	24149743.66	2,41,49,743.66
	77,16,51,146.51		

ANNEXURE VIII

TRADING ACCOUNT

M.P. STATE COOPERATIVE OILSEED GROWERS FEDERATION LTD BHOPAL

TENTATIVE TRADING ACCOUNT FOR THE YEAR ENDED 31ST OCTOBER 1986 (SUBJECT TO AUDIT)

Particulars	Amount for the year 1984-85	Amount for the year 1985-86	Particulars	Amount for the year 1984-85	Amount for the year 1985-86
To opening stock 67,17,28,505.71	4,53,20,416.00	2,19,49,422.35	By sales	34,39,90,112.06	
To purchases	25,57,42,310.17	52,97,96,363.27	By closing stock	2,19,49,422.35	9,75,19,904.06
To purchase Expenses	1,51,77,904.57	3,60,78,891.35			
To processing Expenses	1,78,17,075.73	3,19,81,017.65			
To Gross profit	3,18,81,827.94	14,94,42,715.15			
	36,59,39,534.41	76,92,48,409.77		36,59,39,534.41	76,92,48,409.77

Particulars	Amount for the year 1984-85	Amount for the year 1985-86	Particulars	Amount for the year 1984-85	Amount for the year 1985-86
To Farm, Extension & Development Exps.	23,08,547.97	31,14,771.39	By Gross Profit (Brought forward)	3,81,81,827.94	14,94,42,715.15
To Salary & Allowances	89,65,396.36	98,59,906.91	By Interest Earned		
	55,03,540.90	32,37,362.22			
To Travelling Exps.	12,52,376.92	16,43,662.53	By Subsidy & Grant		
	28,00,397.52	60,00,000.00			
To Postage, Telephone & Stationery	8,75,845.24	14,72,819.10	By Miscelleneous income		
To Vehicle Exps.	7,77,579.00	10,41,402.60			
To Repairs and Maintenance Exps.	46,096.21	73,081.50	a. Transport Rebate		8,67,615.56
To Rent Rates & Taxes	4,48,994.03	5,06,553.60	b. Refund of Sales Tax		6,96,652.00
To Electrical & Water	70,273.05	1,01,336.63			
To Computer Exps.		72,430.48	c. Shortages & Recoveries		2,55,406.73
To Insurance Charges	5,93,316.35	8,54,333.41			
To Publicity & Advt Exps	3,82,238.01	9,53,720.30	d. Dividend		6,000.00
To General Exps.	9,90,676.58	8,45,025.82	e. Disposal of Unseed Material		1,74,089.00
To Interest & Bank Charges	1,90,24,935.13	3,78,45,779.76			
To Selling & Distribution Exps.	2,20,62,082.28	4,01,49,365.78	f. Sale of Tender form		24,225.00
To Audit Fee & Professional Charges	63,604.90	20,30,250.00	g. Others	1,99,204.42	20,85,531.79
To Income Tax (Year 79-80)		3,28,560.00	h. Income from Farm Produces		6,43,493.60
To Depreciation	84,82,992.00	4,32,01,540.14			
To Net Profit (For the Year)		1,74,71,551.10			
To Previous Years Exps.	2,45,947.24		By Net Loss	2,62,05,630.49	
GRAND TOTAL :	6,65,90,601.27	16,15,66,091.05	GRAND TOTAL:	6,65,90,601.27	16,15,66,091.05

ANNEXURE - IX (B) PROFIT AND LOSS ACCOUNT

Particulars	PLANT SEONI MALWA Qty Soyabean	Amount	PLANT Qty Soyabean	SEHORE Amount	PLANT Qty	CHURHAT Amount	PLANT Qty	SEHORE Amount	FEDERATION Qty Soyabean	Amount		Total
Opening Stock								16,64,497		2,02,84,925		2,19,49,422
Purchases	52,926	14,16,36,856	21,091	5,64,42,258	3,471.02	4,34,64,417	5,065.86	5,91,36,207	64,224.71	22,91,16,625		52,97,96,363
Processing Exps.	52,926	1,04,81,392	21,091	47,74,617	-	22,22,681	-	4,49,222	28,587.00	1,11,61,149	1,02,604	2,90,89,061
Direct Purchase Exp		1,26,56,267		50,14,747		-		36,02,432		1,48,05,445		3,60,78,891
Farm Purchase &Exps										6,43,192		6,43,192
Selling & Distribution Exps.		1,63,64,664		70,53,150		36,91,957				1,59,31,552		4,30,41,322
Interest on Fixed Capital		46,82,750		17,94,894		11,67,806						76,45,450
Interest on Working Capital		92,69,246		35,63,286		27,13,000				1,46,54,798		3,02,00,330
Depreciation		65,00,000		90,00,000		1,60,00,000				75,01,540		4,32,01,540
Establishment Exps.		77,84,825		30,84,115		7,05,603		27,06,470		79,73,651		2,22,54,664
Inter Transfer S.E. Oil at Cost					192.02	31,36,320	485.56	77,68,960			681.58	1,09,05,280
NET PROFIT		2,56,19,913		23,72,732				58,30,031		57,58,007		3,95,80,683
TOTAL		23,49,95,913		9,30,99,799		7,31,01,784		8,53,57,819		32,78,30,884		81,43,86,199

Contd...

Particulars	PLANT SEONI MALWA Qty Soyabean	SEONI MALWA Amount	PLANT SEHORE Qty Soyabean	SEHORE Amount	PLANT CHURHAT Qty	CHURHAT Amount	PLANT SEHORE Qty	SEHORE Amount	FEDERATION Qty Soyabean	FEDERATION Amount	Total Qty	Total Amount
SALES												
S.E. Oil	9,340	13,32,97,678	3,711	5,29,62,278	-	-	-	-	3,472.13	4,95,50,996	16,523.13	23,58,10,952
DOC	43,925	10,16,98,235	17,336	4,01,37,521	-	-	-	-	27,556.24	6,38,00,448	88,817.24	20,56,36,204
Bye Product									86.00	1,48,81	86.00	1,48,811
Thiride, Cult-ure etc.										1,18,737		1,18,737
Soyabean									26,473.749	10,48,50,759	24,473.749	10,48,50,759
Soyabean Seed									1,955.40	64,52,823	1,955.40	64,52,823
RSO / RRO							5,594.58	8,16,81,868			5,594.58	8,16,81,868
Mustard									2,628.776	1,57,14,414	2,628.776	1,57,14,414
Vanaspati					1,105.26	2,13,13,938					1,105.26	2,13,13,938
Inter transfer oil to Churhat & Refining									681.58	1,09,05,280	681.58	1,09,05,280
Farm Product										6,43,494		6,43,494
Interest Earned										32,47,362		32,47,362
Subsidy & Grants										60,00,000		60,00,000
Transport rebute								8,67,615				8,67,615
Shortages & Recoveries										2,55,407		2,55,407
Refund of Sales Tax Tax										6,96,652		6,96,652
Sundry Income										4,12,847		4,12,847
Closing Stock						2,96,78,714		28,08,330		6,50,32,854		9,75,19,904
NET LOSS						2,21,09,132						2,21,09,132
TOTAL		23,49,95,913		9,30,99,799		7,31,01,784		8,93,97,819		32,78,30,884		91,43,96,199

Assumptions :- Selling & Distribution Expenses have been allocated on the basis sales criterion is, Establishment Exps.as has been allocated on the Basis of Sales Interest on working capital and direct purchase Expenses have been allocated on the basis of purchases.

Solvent extraction facilities of 200 TPD capacity. This plant was commissioned at a cost of Rs. 90 million sehore plant had commenced production in May 1986.

METHODS OF SEED PROCESSING AT THE SEHORE PLANT

In India, bean harvesting is a manual labour intensive operation. Most of the soybean in the early harvesting period (November-early December) is with moisture contents ranging from 12-14 percent and needs to be dried to moisture levels of around 10 percent. However, the beans available from mid-December onwards have moisture of the order of 9-10 percent and do not need dry operations. Further, since the harvesting is done manually the presence of foreign matter is also minimal.

Soyabean procured from the OGCS and stored in the silos/godowns of the soy plants is brought by a conveyor to a seed cleaner which consists of a trip deck vibrating screen over which the beans are passed. As a result damaged beans and other foreign matter get separated. A destoner is also used to remove stones. Clean beans are then passed through a hot-air drier where the beans are dried at around 75^0 C to a moisture level of 9 percent using hot air. The dried beans are then cooled using ambient air, to a temperature 10^0 C above the ambient temperature and stored in tempering bins for about 48-72 hours. Reduction in moisture contents and subsequent "tempering" bring about the loosening of hulls, thereby ensuring a smooth and uniform cracking dehulling and flaking in the subsequent operations. The dried and tempered beans with loosened hulls are then fed to the cracking mill which is equipped with two pairs of cracking rollers.

Cracking into 6-8 uniform pieces is most desirable since uniformity of cracking leads to smoother operation in subsequent flaking and extraction. After cracking hulls are separated, usually by aspiration, hull with adhering meats are further separated by a hull refining system. Soon operations in dehulling will give hulls with 1.0 - 1.5 percent oil, indicating little carry-over of meats. The hulls after separation are sent to a hammer mill and then to a toaster. The toasted hulls are then ground into a fine powder which is usually mixed with the soyameal in order to adjust its final protein content. After proper cracking and dehulling the soybean meats are subjected to 'conditioning' where live steam is fed at a temperature of around 60^0C. The quantity of live steam is controlled so as to raise the moisture contents to about 10.5 - 11 percent for bringing about the desired plasticity a pre-requisite for making flakes. Since the degree of heating is dependent upon the observed flake integrity, only that heat necessary to produce good flake integrity, is used since excessive would result in damage of oil quality and add unnecessarily to costs. The conditioned beans are then passed through an hydraulic flaking mill consisting of a pair of roller, where pressure is generated with the passage of beans through the rollers which then convert beans into flakes. The tangential angle at the point of meeting of these two rollers has 90^0 appearance and properties of the flakes can be suitably modified by

changing the rpm and diameter of the two rollers. The flake thickness should be 0.25 to 0.3mm A micrometer is constantly available and used frequently to assure uniform flake thickness. Besides the optimum thickness of 0.25-0.3 mm the flakes should neither be packed too tightly nor should it contain too many flakes either of which may impede solvent flow.

The Soya-flakes are then sent to continuous solvent extractor whose design may vary depending upon the principle of percolation/immersion etc. The solvent used is foodgrade hexane, with a boiling range of 65-70^{0}C. The oil present in the flakes gets dissolved in the solvent and forms a mixture of solvent and oil called miscolla which is then passed through a series of distillation operations to separate oil and the solvent in the most optimum manner. Most of the designs use a preheater followed by flasher, an evaporator and another flasher. The oil from the final flasher with little traces of solvent is then fed into a stripper from where it goes to intermediate oil tank and hence to bulk oil storage tanks as such or after water degumming. The oil normally has a flash point of around 120^{0}C. The solvent vapours from the first and second flasher are taken by vacuum into the condensers where they are condensed using cold water. The condensed solvent is then separated from ejector steam condensed water is another equipment and carried over to receiving tank for re-circulation purpose. The uncondensed solvent vapours from condensers are sent to an absorber where cold oil is sprayed from top in a packed column and the vapours rove upwards effecting counter-current. The oil coming down traps the final traces of solvent and passes through an oil to oil heat exchanger. It is then further heated in a steam heater. This hot oil is sprayed from top in an evaporator where saturated steam is injected from bottom under high vacuum. The solvent traces are sent to the condenser where they are recovered. The hot oil from the evaporator is sent back to oil-to oil heat exchanger where it gets cooled and is then further cooled in a water cooler for recirculation in the system. In the solvent plants the risk of fire exists as long as the presence of air within the system is beyond certain limits. Most of the air gets displaced by heavier hexane vapour after the start up. During start-up the internal moving parts of the extractor and the agitator of the DT are kept idle while introducing hexane. The solvent is kept idle while introducing hexane. The solvent is circulated continuously for around an hour or so before switching the extractor for introduction of food material. The start-up operation is generally carried out slowly to reduce the load on vent recovery system. It is also ensured that air entering with the food is continuously purged out by using Co_2 manifold. The hexane in its entirety is drained out first into the ventilated for around 24 hours. The solids/liquids entering the system are also tested for explosion. Piping is also provided for purging out the air from bottled Co_2 manifold.

The meal with left-over solvent (around 30 percent) is carried over to either a Desolventiser Toaster (DT) or steam drying tubes. In either case, the solvent is evaporated from the meal by using high temperature (110^{0}C) and a little vacuum. During the process of evaporation of solvent live steam is injected to the meal which ensures retention of moisture in the meal to optimal limit. The meal after

desolventisation is dried/toasted. The evaporated solvent is taken off to the condenser through a Vapour scrubber where solvent vapour are washed so as to trap the fines. The non-condensibles go to the absorber. The desolventised and dried/toasted meal is then taken to the finishing section when it is cooled in a multistage cooler. Here the meal is retained for sometime in each stage agitated and hot air pulled out with the help of a blower.

The budget (monthwise) 1986-87 of the Sehore plant is given in Annexure-10. The organisation chart and flow chart of Soyabean Solvent Extraction plant is given in Annexure 11 and 11(a),12. The operating cost, fixed expenses, processing cost, are given in the Annexure-12(a),12(b),12(c),12(d).

CONCLUSION

Madhya Pradesh is the leading producer of Soyabean in the country. The M.P. State Cooperative Oilseed Growers' Federation Ltd., has come up in a big way in the field of Soyabean Development, procurement and processing. In fact, in the months of October and November the price of Soyabean reached the rock bottom in the range of Rs. 220/- to Rs. 240/- per quintal. It is to M.P. Oil Federation to procure the Soyabean from farmers in concurrence with the support price of Government of India Rs. 265/- per quintal. Oil Federation has already procured 60,000 MT of Soyabean as a result of which price of soyabean has not stabilised at the level of Rs. 265/- in the initial stages, later on it increased up to Rs. 295/- per quintal.

The Federation procured around 60,000 MT Soyabean at support price within a short period. The Soyabean thus procured will take many months to be processed and hence the Federation is incurring very high carrying cost by way of interest as well as warehousing expenses.

At the present ruling market price of oil, there is no parity for the soyabean purchased even at the support price. The reason for crash in the soyabean price was due to the policy of Government of India directing Vanaspati Industry to lift entire oil requirement for manufacture of Vanaspati from the State Trading Corporation. In this connection, the Government reduced the allocation of imported edible oil to the Vanaspati Industry by 20% firstly from 95% to 85% and subsequently to 75%. Inspite of this the price of soyabean oil did not improve and is quoted at Rs. 10,200 MT (Ex-factory) due to allocation of large quantity of edible oil for supply through public distribution system.

In this connection, the Federation had approached the Ministry of Civil Supplies with request to purchase the oil by M/S Hindustan Vegetable Oil Corporation, at a floor price of Rs. 13,000 MT. The cost

of production of oil works out to approximately Rs. 14,000 per MT (factory).

The Federation officials had discussions with the officials of Civil Supplies Ministry for issue of directions to HVOC for lifting Soyabean Oil produced by them. However inspite of assurances, the Ministry gave direction to purchase oil strictly at commercial terms only.

The Federation is presently saddled with an unsold stock of over 1000 MT of oil and if the same is sold at the ruling market price, the Federation will have to incur a huge loss which will affect adversely the viability of this organisation which undertook massive procurement of soyabean when the market price fell below the support price. This they have done inspite of the fact that they were not declared as an official agency for undertaking support price operation. In case the Government of India does not come to the rescue of the Federation at this juncture, it will have adverse repercussion in the coming years on the complete Soyabean farmer.

ANNEXURE - X BUDGET OF THE SEHORE PLANT BUDGET YEAR 1986-87 FOR SEHORE PLANT

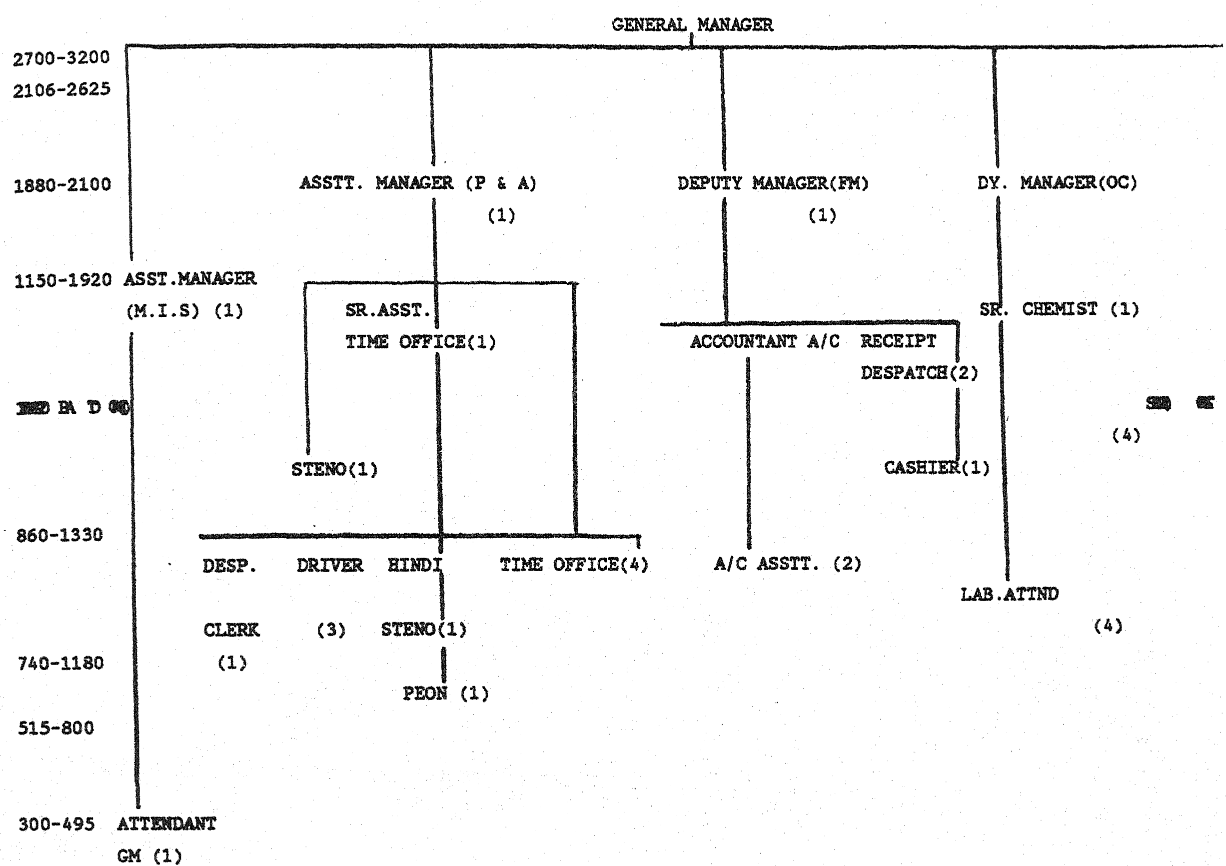
Description	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Aug.	Sept.	Oct.	Total	
Seed for processing	2000	5500	5500	5500	5500	5500	5500	5500	5500	5500	Nil	57000	MT
A. Coal													
a. Consumption 150 Kg/MT	300	825	825	825	825	825	825	825	825	825	Nil	8550	MT
b. Value (Rs. @ Rs. 550/MT)	165000	465080	453750	453750	453750	453750	453750	453750	453750	453750	Nil	453750	Rs.
B. Hexane													
a. Consumption Kl (7 lt./MT)	14	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	Nil	399	Kl
b. Value Rs. (@ Rs. 4600/Kl)	64400	177100	177100	177100	177100	177100	177100	177100	177100	177100	Nil	1835400	Rs.
C. Electricity													
a. Consumption 45 Kwt/MT	9000	247500	247500	247500	247500	247500	247500	247500	247500	247500	Nil	2565000	Unt.
b. Value Rs. (@ 80 P/MT)	72000	198000	198000	198000	198000	198000	198000	198000	198000	198000	Nil	2051000	Rs.
D. Hammali charges Rs. 15/HT	30000	82500	82500	82500	82500	82500	82500	82500	82500	82500	Nil	855000	Rs.
E. Oil Gas Rs. 50/HT (17.7 %) Yield	17700	48675	48675	48675	48675	48675	48675	48675	48675	48675	Nil	504450	Rs.
F. Wages casual labour Rs. 7/MT	14000	38500	38500	38500	38500	38500	38500	38500	38500	38500	Nil	399000	Rs.
G. Spares Rs. 25/MT	75000	10000	10000	10000	10000	10000	10000	10000	10000	10000	350000	1425000	Rs.
H. Salaries	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1200000	Rs.
I. Admn. O/H	52000	52000	52000	52000	52000	52000	52000	52000	52000	52000	52000	624000	

Description	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Aug.	Sept.	Oct.	Total
<u>Sales & Distribution Expenses</u>												
A. Local Transportation of DOC												
@ Rs. 25/MT(47000 MT)	50000	110000	110000	110000	110000	110000	110000	110000	110000	110000	25000	1175000
B. Freight Charges of DOC												
@ Rs. 25/MT(47000 MT)	385000	660000	660000	660000	660000	660000	660000	660000	660000	660000	60000	7285000
C. Freight Charges of Oil												
@ 300/MT of oil (17.7% yield)	80000	290000	290000	290000	290000	290000	290000	290000	290000	290000	20000	3025700
D. Donage Expenses	3000	4000	4000	4000	4000	4000	4000	4000	4000	4000	2000	450000
E. Gunny Bages Sorting												
& Repairing	6000	11000	11000	11000	11000	11000	11000	11000	11000	11000	4000	120000
F. Frieght Charges												
Gunny Bags & Jutes	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	120000
			<u>Expenses related to procurement</u>									
A. Unloading Charges of Soybean	**15000**	**15000**	**15000**	**15000**	**15000**	**7500**	**7500**	**7500**	**7500**	**15000**	**15000**	**150000**
												25519050

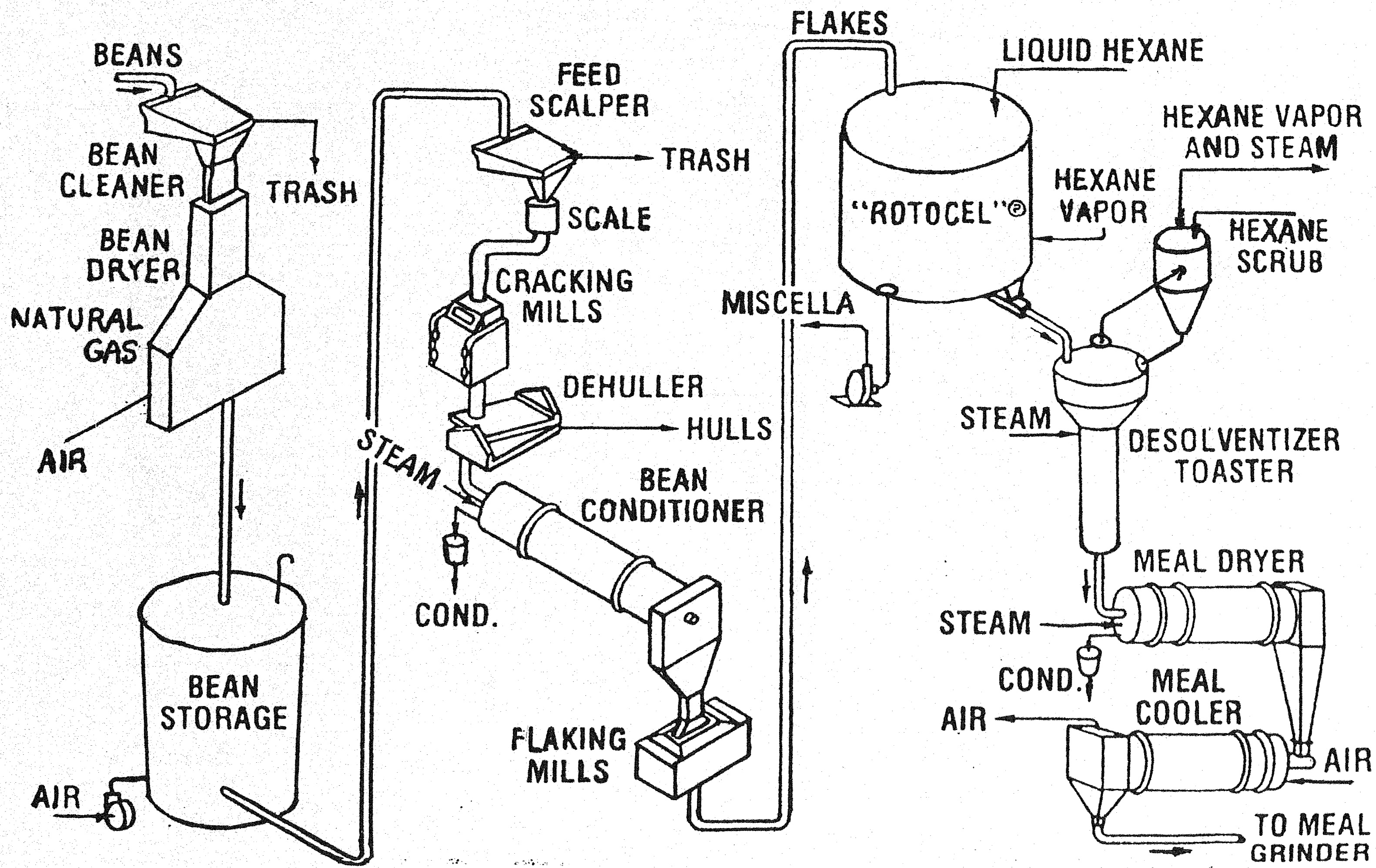
ANNEXURE-XI

ORGANIZATION CHART : SEHORE PLANT

ORGANIZATION STRUCTURE FOR SEHORE 200 TPD SOYBEAN PROCESSING



FLOW CHART OF SOYBEAN SOLVENT EXTRACTION PLANT*



ANNEXURE-12 (A)

PLANT & MACHINERY*

As against the provision of Rs. 55.15 millions contained in the project proposal, an estimated sum of Rs.63.80 millions as under would be required;

S.No.	Item(s) of supply	Estimated cost (Rs. in million)
1.	Solvent extraction plant complete	12.50
2.	Bulk oil storage tanks*	3.50
3.	Bottler complete with water softening unit, coal handling system and process steam piping etc.	10.000
4.	Transformer**, electrical installation OCB cabling etc.	2.50
5.	Material handling and other mechanical transport equipment	4.00
6.	Silo storage section	6.00
7.	Meal grinding and finishing section	3.50
8.	Sub-total of (1 to 7)	42.00
9.	Packaging and forwarding charges	0.84
10.	Freight	00.84
11.	Insurance-Transit and during erection	0.42
12.	Free delivery at site (8 to 11)	44.10
13.	Central sales tax	1.68
14.	Excise duty	1.92
15.	Erection and commissioning	2.10
16.	Total (12 to 15)	49.8

* Refer exhibit-C of this Annex for explanatory notes.
\+ Total capacity - 2000 tonnes
** 1500 KVA capacity

II.	<u>Imported</u>	
17.	Preparatory equipment	8.0
18.	Marine freight, insurance and other charges.	0.8
19.	Duties etc.	4.8
20.	Erection and commissioning	0.4
21.	Total 17 to 20	90.0
III.	Total cost of plants and equipment (I + II)	63.8

OTHER FIXED ASSETS

1.	Workshop equipment.	0.30
2.	a) Stores and spares	0.40
	b) Critical spares for imported items	1.00
3.	Lab equipment	0.30
4.	Fire-fighting equipment	0.65
5.	Furniture and fixed assets	0.30
6.	Internal and external electrification	1.00
7.	Vehicles	0.20
8.	Direct feeder line from MPEB (8KM)	2.00
9.	D.G. set	2.50
10.	Weighbridge	0.50
	Total	9.15

PROCESSING EXPENSES - SEHORE PLANT

ANNEXURE-12(B)

		(Rs. in lacs)
a)	Coal	37.49
b)	Hexane	16.06
c)	Electricity	17.85
d)	Hamali charges	6.25
e)	Coal feeding charges	1.26
f)	Wages for casual labour	1.75
g)	Chemicals	0.53
h)	Spares	5.20
i)	Lubricants	0.76
j)	Salary	9.00
k)	Staff Welfare	0.60
l)	Maintenance of garden	0.60
m)	Others	3.00
	Total	100.35 i.e. Rs.10035000/-

OPERATING COST OF THE PLANT

Particulars	(Rupees per MT)
Coal	87.72
Hexane	41.17
Electricity	45.68
Casual Labour	5.00
Hamali	15.33
Spare & Laboratory Charges	4.00
Total	198.90

Say Rs. 200 per MT.

ANNEXURE - 12(C)

FIXED EXPENSES

1.	Interest on term loan at 10.5% on Rs. 500 lakhs	52.50	52.50
2.	Depreciation		
	(A) Plant and Machinery	72.50	
	(B) On Building	10.50	82.50
			135.00
3.	Fixed expenditure /MT of Soyabean processed.	13500000/60000-225.00/MT.	

ANNEXURE - 12(D)

STATEMENT SHOWING CALCULATIONS OF PARITY IN PROCESSING OF SOYABEAN

		(In Rs./MT)	
1.	Cost of Soyabean delivered at Plant Average procurement price of Soyabean	2650.00	
2.	Commission to Societies	40.00	
3.	Incidental charges paid to societies	12.00	
4.	Mandi tax @ 1%	26.50	
5.	Cost of 11.11 gunny bags at Rs. 13/bag.	144.40	
6.	Average transportation charges from societies to Seoni Malwa	60.00	
7.	Warehousing expenses for six months	30.00	2,962.80
II.	Cost of processing		
1.	Variable cost of processing (See Annex. II)	200.00	
2.	Fixed expenses such as interest on term loan, depreciation etc. (See Annex. II)	225.00	425.00
III.	Financial Expenses		
1.	Interest on working capital @ 13.0% for 6 months	192.59	
2.	Overhead expenditure of Federation (Rs. 60.00 lakhs/annum)	86.00	278,60
IV.	Total Cost of production (I+II+III)	3,666,50	
V.	Revenue from sale of 80% soya meal at Rs. 1623/MT.ex-factory	1,299.20	
a.	FOB price of Doc/MT	1,900.00	
b.	Less Transportation charges	155.00	
c.	Less Handling charges	70.00	
d.	Less Cost of two addl. gunny bags.	28.00	
e.	Loading expenses at Seoni Malwa	23.00	
		276.00	
2.	Net revenue from sale oil so That the operation breaks-even	(-) 3,665.50 2,367.30	
3.	Price per MT of oil (ex-factory) considering yield of 16.8%	1,299.20	
	Recovery		
4.	F.O.B price of oil at Delhi considering transportation charge at Rs. 500/- per MT (14091 + 500)	- 14591/MT	
	Total revenue from sale	3666.50	

USAID SPONSORED TRAINING PROGRAMME

ON

PLANNING IMPLEMENTATION AND EVALUATION

OF AGRICULTURAL PROJECTS

(APRIL 20-MAY 15, 1987)

RE-APPRAISAL OF HIMACHAL PRADESH APPLE PROCESSING AND MARKETING PROJECT (INDIA)

BY

TRAINING OF I.I.P.A.

1. Shri V.G. Balar
2. Shri C. V. Naik
3. Shri Kanwal Kumar Narang
4. Shri K.J. Nandeshwar
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An important role in undertaking this economic report during our training programme was played by Mrs. S. Saroja of the Institute being the Course Director. An instrumental role was also played by Shri R.K. Verma of the Institute who accompanied us to the project and helped us in coordination with the authorities of the project. The group was very much benefitted from the guidance and suggestion of the Course Director in bringing out this report. The group is very much indebted and grateful to her.

BACKGROUND

Himachal Pradesh is a hilly state located in the top of Himalaya in the North-west of India. A major portion of the population is dependent for its livelihood on Agriculture. About 6 lakhs hectares of the land in the state is under cultivation and per capita-average holding is less than 0.15 hectare of cultivable agricultural land. As such, the state is more suited for horticultural crops rather than agricultural crops. Topography and agro-climatic conditions of the state are quite suitable for the production of various fruits. Thus, more in-come can be derived by development of horticulture in the state and getting more production from the orchards.

INTRODUCTION

The development of Horticulture in the state was made possible due to the pioneering efforts of Mr. Satya Nand Stokes, the father of apple cultivation in Kotgarh near Shimla and Captain Lee who brought strains of delicious apples and established apple orchards at Kullu. There after there has been a silent horticultural revolution during the past three decades which put Himachal Pradesh on the fruit map of the country.

In H.P. the area under apple cultivation which stood at 3025 hectares in 1960-61 increased to 4940 hectares by 1984-85. The production of apple made a spectacular increase from 12000 tons in 1960-61 to 1,70,629 tonnes during 1984-85. The present level of production is about 4 lakh tonnes in the state.

OBJECTIVE OF THIS STUDY

1. To study the main objectives of the H.P.M.C.,
2. To know the project design and its technical components;
3. To study the transportation, procurement of raw material, grading, packing, storage and finally processing of raw material;
4. To supply the quality products at a reasonable price, to consumers.
5. To review the project in order to maximise its value additions and income to farmers.

PROJECT IN BRIEF

The unprecedented gigantic growth of fruit cultivation made it imperative to create an infrastructure that could cater to this large input of raw fruit and channelise the input through sophisticated processing and modern marketing methods with a view to ensuring a remunerative price to the cultivator and protecting him from the intermediaries and raising their standard of living and providing them some infrastructure for future development by spreading an extensive net-work of Fruit processing plants. The H.P.M.C. Ltd, was set up in June, 1974 as a subsidiary company of the Himachal Pradesh Agro-Industries Corpn. Ltd.

The project was approved in 1972-73 at a cost of Rs.16.5 crores, with the following:-

a) Packing Houses - 6

b) Grading Houses - 4

c) Processing Plants - 2

d) Cold storage - 5

e) Transhipment centres - 2

f) Cable ways with 20 km. wide

g) Roads connecting orchards-400 km;

Besides these, three shopping centres at Shimla, Bombay and Delhi and a number of sub-offices.

However, the project at the initial stage did not become operational due to escalation in costs. As such, a price review

Committee was set up and its report was submitted in 1975. There was no change in the size of the project.

The project had two components viz. Commercial and non-commercial. The commercial component comprised of packing, grading, cold storage and cable ways. The non-commercial component comprised of roads and communications, development works like refrigerated transport and cool houses and training of manpower and also providing inputs to the farmers.

The project was completed in 1982. There are two transhipment centres. The Kullu and Mandi areas are taken care of by Kiratpur Sahib centre and the other centre is at Parwanu.

As the development of grading and packing of fruits would help in standardization and help in preservation for a longer period and would also save the farmers from the clutches of intermediaries from exploitation, packing houses were established. The packing houses capacity was 5000 tonnes per season. Similarly the grading houses were established with the capacity of 1000 tonnes. The capacity of the cold storage attached to packing centres was 1000 tonnes per season.

The cold storages have been set up at terminal markets but the advantage would have been higher if these would have been near the producing centres with a higher capacity to store particularly during the off seasons to ensure better shelf life and low deterioration in quality and to maintain a regular supply during off-season. There is no refrigerated transport available as it was envisaged in the project.

The H.P.M.C. has developed in a big way with an extensive network of distribution and improved upon the system of marketing. It operates through 5 zonal offices and shipping centres at Shimla, Bombay and Delhi and 9 sub offices which are spread over in different parts of the country.

The HPMC has two processing plants. One plant was made available to them under Indo-German Agricultural Project with a capacity of 1800 tonnes as a gift. The other plant has a capacity of 18000 tonnes and was made available to them under the World Bank Assistance Project. Last Year the utilisation capacity of this plant was 16000 tonnes.

Juice Dispensers- 5 dispensers were procured from Germany as a free gift initially. Later on 200 dispensers were imported under the project. It may be mentioned here that the quality produce served through these dispensers does not fulfil the specified requirements. They tend to add more water to the apple concentrate as against the stipulated six times of water to its quantity of concentrate. However, efforts are being made by the organisation to improve the situation.

At the initial stages of the project, the calculation of profitability regarding the cost of apple was considered at 45 paise per kg. The corporation, however, was made to pay Rs. 1.50 per kg. which was almost three times of the cost envisaged in the beginning.

The above project is running at a loss presently. The Year of 1985-86 was the year of strains and stress yet it witnessed a further down- slide trend in the loses from 243 lakhs in 1983-84 and Rs.209.98 lakhs in 1984-85 to Rs.175.81 lakhs in 1985-86. The losses could have ben reduced provided the corporation continued its activities of fungicides and pesticides.

Some of the reasons due to which the project is running into losses are as under:-

1. Some components like packing and grading houses which should have been treated as Developmental were considered only as commercial from its inception.

2. Financing pattern adapted for the project has not been commensurate with the character of the project. Debtequity ratio was 3:1 too much reliance on debt makes it a unprofitable proposition.

3. Unsatisfactory stock position during peak season due to failure of crops last year was also a contributing factor for the low turn over.

4. Corporation function was also limited due to recalcitrant attitude in the extension of facilities for working capital by the commercial Banks.

5. From the view of corporation, it was observed that the rate of interest is on the higher side where as Govt. of India has to pay debt services at a very low rate of interest for such purposes to I.D.A.

6. Its authorised capital is the same as its membership is not allowed to increase due to its nature being a holding company.

7. H.P.M.C. has also not succeeded in supplying the quality apple and -its products to the consumers at a reasonable price due to lack of proper management and their marketing problem. The entire market is not in their hands. Since the corporation do not have there storage facility of its own, in they have to pay Rs.20/- per kg. for keeping the apples in the storage.

8. Further, the H.P.M.C. has provided other basic infrastructure which has increased the cost of its performance.

Since the H.P.M.C. was incurring losses, a committee was set up to review its functioning. On the recommendation of the same, a rehabilitation report has been worked out. The report provides for:-

1. H.P.M.C. has to assure a certain level of achievement
2. The Government has to provide capital and re-adjust the debt- equity ratio and make it 1:1.
3. The Financing institutions have to charge a concessional rate of interest.
4. The terms of payment have to be re-Scheduled.

The rate of interest currently charged is 12 1/2%. This needs to be reduced atleast on components which are purely of development nature.

Delays raise the costs and this has happened in this case due to prolonged discussions and arriving at the decisions very late. All possible steps have to be taken to reduce the delays in decision making and in their implementation.

Marketing and processing activities have to go together with a constant vigil.

An important aspect of the dismal performance of the corporation is its lack of publicity for its in products. Very little amount has been spent on publicity. This needs to be enhanced suitably with care.

The working capital requirements were not worked out properly which has resulted in problem to the corporation, needs to be sorted out.

A step in the right direction has been taken by HPMC in the development of substitute packing in cartons as against the traditional wooden boxes. This would definitely reduce the pressure on wood. A card board plant is being Set up and cartons would be supplied at subsidized rates.

ONCLUSION

No doubt H.P.M.C. has occupied a very important role in the economy of the state of Himachal Pradesh. Today it is one of the most modern fruit processing plant not only in India but in the whole of Asia. The H.P.M.C. has assured minimum price to the farmers Which was not available to them earlier. They used to feed the applied to their cattle or throw it outside. This has helped them to raise their standard of living.

The activities of the H.P.M.C. has provided regular employment to about 400-500 farmers and persons and also seasonal employment at various levels.

The H.P.M.C. is providing various inputs, like power surveyors and grass hopers. Though on a nominal scale, this has helped the farmers to increase their production and efficiency.

Since a majority of the farmers are marginal and small, the project will prove extremely useful- in upgrading their well being and thus helping the state of economy to a greater self reliance, it may be continued with adjustments and constraints keeping in view the long term prospects of the farmers at large. It may be treated as a developmental activity rather than a commercial one for which the assistance and care at different times at different stages is necessary. The activities of the corporation may be diversified to the possible extent.

USAID SPONSORED TRAINING PROGRAMME
ON
PLANNING, IMPLEMENTATION AND EVALUATION
OF AGRICULTURAL PROJECTS
(APRIL 20 - MAY 15, 1987)

INLAND FISHERIES PROJECT IN INDIA
RE - APPRAISAL OF
JAMUNADIGHI HATCHERY PROJECT OF WEST BENGAL

BY

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Participants

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INLAND FISHERIES PROJECT IN INDIA
APPRAISAL
OF
JAMUNADIGHI HATCHERY PROJECT OF WEST BENGAL
IN
BURDWAN DISTRICT

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Inland Fisheries Project in India

Re-Appraisal of Jamunadighi Hatchery - Project in West Bengal

INTRODUCTION

Fisheries forms part of the multiple benefits that emanate from water resources is an important activity in India. Fish can provide nutritious food for millions of illfed Indians and earn foreign exchange too, Investment in fisheries development should therefore, prove useful in India. In an attempt to explore problems related to the estimation of benefit from the fisheries development, we have taken up an economic evaluation of a hatchery project named Jamunadighi of West Bengal State in Burdhwan district.

Though fish farming is practiced through out the country, but a major portion of the cultured carp is produced in five leading pond culture states viz West Bengal, Bihar, Orissa, M.P. and U.P. The main species are catla, Mrigal and Rohu.

West Bengal has a land area of 8,85,551 Sq. km. and population, according to 1981 census, is 54.5 million. West Bengal tops in the fish production among the states of Indian Union, producing annually about 4.25 lakh tonnes of which 3.84 lakh tonnes produced from inland fisheries. The annual requirement of fish in West Bengal, according to National Commission on Agriculture, is about 5.37 lakh tonnes. Thus it can be said that the state of West Bengal is suffering from deficiency of fish by about 1.12 lakh tonnes. The large gap between the demand and supply, fish being an important item of daily diet of Bangalees calls for concentrated efforts for increasing fish production by developing inland fisheries by Government of West Bengal.

Fish culture is an age old practice in Bengal. Bundh breeding was known in these areas since 1882. Later on the induced breeding became successful in late sixties in West Bengal Subsequently in the beginning of eighties, the Eco-hatchery technique was developed in the state to boost up the production of spawn to many fields.

Though India has a great potential for rapid expansion of fish farming but there is a lack of high quality fish seeds in large quantities for which a broad Institution and Organisational base was needed. To minimise this gap a step towards establishment of modern fish hatcheries at different suitable places in different states was taken. Its main aim was to produce better quality fish seed and to cater the internal as well as external demand of the farmers and also to support substantial institutional development in the country. To achieve this objective, the West Bengal State with the approval of the Central Government under the World Bank aid setup hatcheries in potential area. Out of these, Jamunadighi hatchery in Burdhwan district is the first to start its operation.

HISTORICAL BACK GROUND

Nearly 50 years ago the present project area of Jamunadighi hatchery was a fallow land belonging to local Jamindar of Eral P.O. Village Raghunathpur. Being this area low lying, it was used as reservoir and its water was used by the surrounding farmers for irrigating their paddy, wheat and mustard crops. In 1970-71, this land was acquired by state Government, since then fish farming is being practiced and 12 tanks were constructed by the Directorate of Fisheries. Subsequently in the year 1980-81 with the setting up of the F.S.D.C. the entire area of 40 hectares including the present project area was taken up for fish seed breeding.

AIMS AND OBJECTIVES OF THE PROJECT

The objectives of the hatchery project are:-

(1) Optimizing production by using input viz fish seed, feed and fertilizers.

(2) Conservation of fish in different types of inland

(3) Uplift of Socio-economic condition of fishermen community by using fisheries development programme as tool for improvement of economic condition of poor fishermen.

(4) Repair of environmental degeneration through development of fisheries,

(5) Generation of rural employment and income through fisheries development programme,

(6) To acquaint the fish farmers with the new technology of fish breeding,

(7) To cater the demand of consumers for fresh water fish from Jamunadighi Hatchery.

LOCATION

Proposed site of the project which is of a 25 ha model for a modern fish seed hatchery is located in the western part of the Burdhwan district. It is situated about 12 km. from Mankar Railway station and about 160 km from Calcutta. There is an existing seed form of the state Fisheries Deptt. The Govt. of West Bengal transferred the land including the project area site which is about 34 hectares to F.S.D.C. for the setting up this type of modern Eco-Hatchery for fish breeding.

AVAILABILITY OF WATER

The hatchery is solely dependent on the Ground water supply for fish breeding. For this purpose three tube wells have been dug out, of which one is a stand by arrangement with 200 mm diameter and about 200 meter depth. The tube wells have been fitted with electric pump each of 16 H.P. To assure regular supply of water and electricity, two power generator sets of 22.5 k.v. each have been installed.

SOIL

The Soil of the project area is predominantly silty clay and fairly impervious. The soil was tested by the soil scientists and was found to be suitable for fish farming. There is also no loss of water due to seepage. Ground water table is varying between 2.0 - 8.5 meters below the ground level over the year, and hence possibility of drying of ponds in the project area is very bleak.

AREA OF THE PROJECT

In the state two types of Eco-hatcheries have been developed covering an area; 5 of 10 hectare and 4 of 25 hectares respectively. The total production of these hatcheries is 158 millions of fingerlings. The Jamunadighi hatchery project is included in the second category which covers an area of 25 hectares.

CULTIVABLE AREA

In West Bengal State pond fishery occupies an important position amongst all the inland fishers resources. Of the total 2.75 lakh hect. of available pond water, 70.28 percent are in cultivable condition. Hence there is a great scope for development of hatchery to provide good varieties of seedlings.

RAINFALL

The rain water is available in the project area from June onwards and maximum rainfall is expected in months of July and August, which is nearly 750 mm from South-West monsoon. The annual average rainfall is about 2000 mm.

TEMPERATURE

The temperature in the project area ranges between 25c^{0} to 28c^{0} in Kharif season and 10c^{0} to 20c^{0} in rabi season. On an average temperature in the project area remains nearly 15c^{0}. The above temperature of the project area is congenial for the production of fish seeds.

INFRASTRUCTURAL FACILITIES

The hatchery has completed building its infrastructure for breeding operations such as construction of water tanks, hatchery houses, administrative building - cum guest house, breeding tanks, breeding bundhs, roads and canals, staff quarters, store building etc.

Perimeter bundh has been made around the entire area to cut-off the main project site from probable flood waters. The bundh has been kept at a level of 51.0 m which is nearly 0.5 m above the H.F.L. of the area.

The Bank facility is also available in the project area in Itachanda village.

Three tube wells have been constructed with two power generator sets to assure the regular supply of water and electricity.

OTHER INFRA-STRUCTURAL FACILITIES

Besides the above, the other infra-structural facilities such as proximity to the area of demand for fingerlings, proximity to all weather road connections, availability of electricity and labour and also inputs are considered adequate during natural course which helps indirectly to the project transactions.

DETAILS OF THE PROJECT

The Jamunadighi hatchery project is having the following facilities in the project area:

(1) 32 Ponds, all measuring 6000 m^{2} on an average (8 ponds for breeding and 24 ponds for rearing) with a central canal, connected with internal channels are to be constructed, of which 3 are yet to be completed.

(2) Indoor Hatchery Building

(3) Administrative Building

(4) Breeding and Rearing Equipments

(5) Store Building

(6) 3 tube wells with electric pump sets

(7) Staff Quarters.

Out of the 32 proposed tanks, 7 tanks have been segmented. Presently only 13 tanks are being utilised where as 23 tanks including 7 segmented tanks are remained unutilised. In 1987-88, 3 uncompleted tanks will also be completed and all the 32 tanks are expected to be fully utilised.

STAFF PATTERN

The staffing pattern as suggested in the project was as follows:-

1.	Hatchery Manager	1
2.	Asstt. Hatchery Manager	2
3.	Head Clerk - Accountant	1
4.	Typist cum-clerk	2
5.	Cashier	1
6.	Driver	1
7.	Fisheries attendant-cum watcher	14
8.	Peon	4
9.	Night Guard	2
10.	Mechanic-cum-pump Operator	2
11.	Helper-cum-Guard	1
12.	Hatchery Technician	3
13.	Electrician	1
14.	Sweeper	1
		37

LABOUR POTENTIAL

It was observed that most of the labourers are engaged on casual basis. Presently twenty labourers including fishermen and watchman are paid @ Rs.21/- per man day with 8 hours duty. There is equal percentage of skilled and unskilled labour engaged in the project. Only 5 persons are in the project from Managerial side including one post each of Hatchery Manager and Asstt. Hatchery Manager Similarly one post each for Accountant cum U.D.C., Store keeper and Mechanic cum Pump Operator. Presently there is no need to strengthen the staff.

ON FARM INVESTMENT

The initial capital cost of the Jamunadighi project was estimated in 1980-81 in two major heads - (i) Civil/construction cost and (ii) Equipment cost at the prevailing market rate, of Rs.70.45 lakhs, keeping in view the overall cost of economy in mind with a provision of essential requirements. This estimated cost included both equipment costs as well as the physical contingencies over the entire project period. The exclusive of construction cost was estimated Rs.58.09 lakhs as compared to equipment cost of Rs.3.65 lakhs and physical contingencies of Rs.8.71 lakhs amounting to total cost of Rs.70.45. The above costs of construction also includes the cost of electric supply and distribution and also the engineering cost of the project which includes the expenditure on consultancy for execution of the project.

Cost of equipments provided in the project for various operating vehicles, portable pump sets and accessaries and office furniture. The cost of pump sets and electric meters to provided as per the I.D.A. instructions and this was treated as a foreign exchange component in the project cost.

UNIT COST

The details of the unit cost of various items on the basis of the assessment made by the team taking in to account the accepted tendered price by the F.S.D.C.

15 per cent on the civil works is also provided as a contingency to cope with any physical contingencies which are likely to arise during the construction period. Working capital during the first two years of production period i.e. 1983-84 and 1984-85 is also capitalised.

The F.S.D.C., the beneficiary, has to provide 30% of the investment cost as its own contribution from its own resources.

PHYSICAL AND FINANCIAL PHASING

The project was expected to be completed in three years, 1982-83 to 1984-85. The F.S.D.C. expected to complete 10 rearing ponds during 1982-83 and start production immediately. But the production could be started from the year 1984-85 on a trial basis. Taking into account physical and financial phasing of the proposal, the bank finance and NABARD finance were worked out in the following way.

Statement of Unit Cost of Approved Project
(Rs. in lakh)

Items		Project Cost	Phasing for the years 1982-83	1983-84	1984-85
(A)1(a)	Civil Works	52.81	18.10	23.74	10.97
(b)	Engg. Cost	5.28	1.81	2.37	1.10
(c)	Physical Contingencies	8.71	2.98	3.92	1.81
2	Equipments	4.15	1.85	0.60	1.70
3	Working Capital	9.52	-	4.02	5.50
(B) (b)	Total financial outlay	80.47	24.74	34.65	21.08
(c)	Contribution by FSDC(Govt.of W.B.)	24.14	7.42	10.40	6.32
(d)	Bank Finance	56.33	17.32	34.25	14.76
(e)	NABARD Refinance	50.70	15.59	21.83	13.28

The Cash flow, NPW and IRR of the scheme investments have been indicated in Annexure I. It was informed by the Hatchery Manager/FSDC that the Hatchery will be able to produce more variety of Exotic of Grass carp be cause of its increased demand Presently, the Hatchery is producing three main Indian Carp namely - (1) Rohu, (2) Catla and (3) Mrigul. Besides these exotic quality of fish seed is also taken up. This includes the Gras Carp, Silver carp and common Carp. The maximum production of India variety is 75% of which Rohu is the maximum where as the ratio of the other two qualities is equal. The ratio between these quality is 4:3:3. In the month of June and July Rohu is produced more and next Catla and lastly the Mrigul. The ratio of exotic quality is Grass Carp, Silver carp and common carp is 7.5: 7.5:10 respectively.

Recently the Hatchery has introduced a Japanese quality called Japanese Puti because of its local demand.

Though the production was started after completion of three years but in actual sense the production started in 1984-85. It took three to four years completely for the infrastructure of the project. Only 5 tanks were constructed initially. In 1984-85 the Hatchery Project could construct only 13,Tanks, due to contractor problem, out of 32 as proposed in the plan and only 5 tanks could be utilised for the purpose the remaining 8 tanks were unutilised due to less demand in the area because of less publicity of its activity. Similarly in 1985-86 only 10 lakhs could be utilised with a capacity of 4 crores of spawn. The estimated targets of production were aimed as follows:-

PROGRAMME & PROGRESS 1985-86 & 1986-87

Items	Targets 1985-86)	Achieved in 1985-86	
Spawn	10 crore	4.5 crores	Sold 2 cr.
Fry (15 days old)	1 crore	50 lakhs	50 lakhs
Fingerlings (3 months)	15 lakhs	15 lakhs	15 lakhs

As there is a target of 32 tanks in the project. During 1986-87 only 13 tanks have been utilised. The 7 tanks have also been segmented in the project and thus the number of tanks after their segmentation has increased to 39 nos. During 1986-87 only 13 tanks have been utilised and the remaining 23 tanks are not in use and 3 more out of 39 are yet to be completed.

Inspite of the above number of tanks, the project has utilised only 13 tanks and keeping in view the present demand, only 20 or 22 tanks can be utilised in an optimum manner according to production target thus having a dead investment of capital over 12 Tanks. Which is left only for the future demand.

It was suggested that the Hatchery will be able to produce 50% of its target of 27 million fish seeds during the year 1983-84, 70%. during the year 1984-85 and 100% from the year 1985-86 onwards. After working out the economics, it is expected that the hatchery has been able to achieve only 30% of its target i.e. 1983-84 in view of the very slow progress at the site.

As the demand in the area as well as in the state is for fingerlings the available tanks should have been utilized for fingerlings production there by additional income would have been generated.

PRODUCT PRICES

The prices of the seeds are given as under:-

Seedlings	Indian Products (Rohu Catla & Mrigul)

(1) Spawn @ Rs. 200 per lakh

(2) Fry below 2 cm @ Rs.15 per 1000

(3) Fry 2 to 3 cm Rs. 20 per 1000

(4) Fingerlings 3 to 5 cms @ Rs. 30 per 1000

(5) Fingerlings 5 to 7 cms @ Rs. 60 per 1000

(6) Fingerlings @ Rs. 175 per 1000
7 to cms

These prices are usually in the months of May to January, in the year prices of seedlings are fixed on annual basis. During the lean period from Feb. to April, the prices are higher in case of exotic.

The prices during lean period are approximately as follows:-

Spawn	@ Rs. 300/- per lakh
Fry	@ Rs. 25/- per 1000
Fry	@ Rs. 30/- " "
Fingerlings	@ Rs. 45/- " "
Fingerlings	@ Rs. 90/- " "
Fingerlings	@ Rs. 250/- " "

LIMITATION

During the course of our study of the Hatchery project, it was observed that it has actually benefitted to the farmers.

2) Lack of transport system in the project area is very much felt and this has resulted the sales performance of Project in question. Improvement of transport system in the area for seedling at the doors of the farmers will increase the sales for which Govt. should think of transport subsidy of oxygenerated containers.

Training is required to teach the farmers to use spawns & Fry's rearing so that the production can be multiplied to increase the profitability.

It was observed that out of 29 tanks only 19 tanks are being utilised for the rest of the tanks multiplication of spawns to Fry and could have been taken up due to demand for the fry and Fingerlings more.

MARKETING

There is no difficulty of marketing in West Bengal State. The production total 4.25 lakh m.t. The Fingerlings Marketing also no difficulty. The farmers are coming to hatchery point & carrying the seedlings.

If the seedlings carried in a oxygenerated boxes percentage of mortality will be less, for which farmers are to spend Rs.400/- per he. for 100 box @ 4/- per box. It was learnt that farmers carry in the vessels, and there by mortality loss up to 30%. This is the only constraint. If this is over come there will be great demand for spawns. Since at present the production is being sold and there are lot of private nurseries available. The demand is for fingerlings, but the farmers are to be educated regarding use of spawns or Fry. It is better if Fry-seedling are used which the farmer has got interest and there by more sales could be promoted.

SUGGESTIONS

The project has not made profit rather incurring losses due to its delayed construction production at initial stage for which the management has to looked into as the state Govt., shall ensure that the F.S.D.C. carry out its business on commercial lines and their activities relates mainly to promotion, production and marketing.

The project inspite of the internal demand in the area for fingerlings has not been able to meet the demand and stopped up its production process, which is to be taken care or trained farmers to use spawns either of these are to be ensured.

The activities of the Hatchery project is not known amongst the larger area, fish farmers. The project has not been able to create an impact on the farmers in an impressive way to induce them to use spawns.

It was observed that less efforts have been made with regard to publicity or propagation of its activities in the area as well as outside the project within the state as well as outside the state. If

steps are taken in this direction, it will lead to fruitful results to the project for its future aims and objects.

The need for Marketing facilities, in the project area has been felt. The project is able to sell in a limited area to local farmers only. 10% of the production is consumed by local farmers. Where the 90% is consumed outside the project area with in the District.

Presently the total number of tanks is 39 after segmentation of 7 tanks in the project. Only 13 tanks are being utilised by the project and the remaining are idle and resulting unnecessary cost of maintenance etc. 3 nos tanks are yet to be completed. It was observed that only 20 to 22 tanks can be utilised to their maximum capacity in view of the present demand and the production capacity. To use all the tanks for the production process is not advisable and it will save their expenditure.

Desilting work of tanks is required after 10 yrs but the inputs used in the tanks after 5 years will be reduced to 25% and in the subsequent 5 yrs. it will further reduce the cost of inputs by 15% more. Thus after a period of ten years about 40% input cost looked in relation to tank utilisation for the production.

Though training programme is organised at Block level outside the agency of project in which Project officers sometimes participate but no local farmers are being trained by the project itself which may be taken up also in the interest of the Hatchery Project.

This study has provided us an opportunity to explore the problems related to risk and uncertainty in the processing of fish breeding in the estimation of social benefits and other related advantages of fish development in the area which will enrich our knowledge and shall help and guide for further projection.

Though our study of the Project indicate that it is running at a loss regularly at the initial stage, however the project is an employment oriented.

The project life is 15 years and during this period it will provide a sound infrastructure for the future growth of fish-breeding on a large scale to the area as well as a process of developmental activities for fish in the state.

The project will first cater to the needs of the small farmers as well as the local farmers which will ultimately fulfil the Cherished wish of consumers preference for fresh water fish in various qualities of fishes (Indian and exotic both) and also in various sizes.

The economic rate of return has been found to be beneficial to the project beneficiaries. The direct beneficiaries will be rural and semi-urban population of the area who heavily depend on the supply from outside.

The rural Poor including the landless labourers, small and marginal farmers and members of the minority community and weaker section of the society would be particularly benefited by the additional employment that the project activities will create in future and also from the Production Process to the small and marginal farmers for fish farming.

Environmental benefit: Major environment of benefit will be of soil and water conservation, improvement of soil fertility and increased underground water supply, improvement in microclimatic conditions.

The project will have its impact on the upliftment of socio-economic conditions of the area as well as the fishermen community by using fisheries development programme as a tool for improvement of economic condition of poor fishermen.

By the modern process of fish Breeding through the Hatchery project the financial position of the farmers as well as the workers will improve and it may attract the small farmers or marginal farmers to prefer pond fish cultivation rather than paddy cultivation. Since the project has made the profession a profitable business 10% persons in the area have converted their land into pond for fish cultivation because of its benefit in fish farming with the help of this project in their area.

It is therefore, suggested that the project will go a long way in serving the poor small and marginal farmers as well as the labourers.

It is felt now on the basis of our Observations that the pisciculture is more paying than agriculture. The composite fish seed multiplication form breeds nurses and rears brooders for intensive fish farming. Even at the high attitude this experiment has succeeded in other places of the country. Hence the project should retained its shape and may expand its scope and allied activities in the area. Since it is a law - cost high profit venture and it is ideally suited for paddy-cum-fish cultivation even in the difficult area where the acute shortage of animal protein is felt, fish farming has came to their rescue but they certainly need some scientific training and processing in fish farming and regular supply of fish seeds at a reasonable cost in sufficient quantity with its quality. These Hatchery Projects will help them abundantly. Hence, inspite of the difficulty and constraint in the present Project, we must see it from long term benefit point of view and should manage it with all trial and error method to up keep it in the interest of the masses.

INTERVIEW WITH THE FISH FARMERS

During our field study we also visited some of the fish ponds nearly Jamunadighi Hatchery project area. We also contacted the fish farmers of village Suata and Raghunathpur.

On enquiry with the farmer Shri Sayed Abdul Fuzzal of village Suata, it was learnt that he had taken a pond of 1.40 hectares on lease basis @ Rs.10,000/- per year. He had taken loan of Rs.12,000/- at an interest of 16.5% from United Bank of India. He also availed subsidy @ 25% from F.F.D.A., Burdhwan District. He reared fish varieties viz. Catla, Rohu and Mrigal, seed which was purchased from Jamunadighi hatchery.

On enquiry with Shri Ujjal Mukharji of village Raghunathpur, it was learnt that he had constructed a fish pond of 0.10 hectare size on his own land. He had taken loan of Rs.3,430/- at an interest rate of 12.5% from State Bank of India and also availed subsidy @ 25% from F.F.D.A. He had reared fishes viz. Catla, Rohu and Mrigal, seeds of which he obtained from Jamunadighi hatchery. Economics of fish production of both the above farmers is presented in table no.1.

From the data presented in table no.1 reveals that per hectare net profit from fish farming was higher in case of small farmers (0.10 ha.) than the big farmers (1.40 ha.). B.C.R. in case of big farmers comes to 1.59 where as in case of small farmers it comes to 2.15

TABLE No.1

BENEFIT COST ANALYSIS OF BIG AND SMALL FISH FARMERS - JAMUNADIGHI HATCHERY PROJECT AREA

Particulars	Big Farmer	Small Farmer
1. Beneficiary	Abdul Fazzal etc.	Ujjal Mukharji
2. Village	Suata	Raghunathpur
3. District	Burdhwan(W.B.)	Burdhwan(W.B.)
4. Area of cultivation	1.4 Hectare	0.10 Hectare
5. Financial institutions	United Bank of India	State Bank of India
Loan	Rs.12,000/- @ 16.5%	Rs.3,430/- @ 12.5%
Subsidy	25% (F.F.D.A.)	25% (F.F.D.A.)
I. Cash Inflow - Loan	Rs.12,000/-	Rs.3,430/-

Contd...

Particulars	Big Farmer	Small Farmer
II. Cash Outflow - operational cost		
1. Pond Preparation	Rs.10,000/- (as rent)	Rs.1,000/-
2. Seed	Rs. 1,500/-	Rs. 175/-
3. Transportation	Rs. 1,500/-	Rs. 60/-
4. Cakes	Rs. 2,975/-	Rs. -
5. Cow dungs	Rs. 9,100/-	Rs. 130/-
6. Superphosphate	Rs. 200/-	Rs. -
7. Lime	Rs. 110/-	Rs. 50/-
8. Netting etc. labour	Rs. 720/-	Rs. 175/-
9. Bank Instalment	Rs. 6,000/-	Rs. 550/-
Total Cost	Rs.31,605/-	Rs.2,140/-
III Output Value of Produce	Rs.50,000/-	Rs.4,600/-
IV. Net Profit	Rs.18,395/-	Rs.2,460/-
Profit per hectare	Rs.13,139/-	Rs.24,600/-
B.C.R.	1.59	2.15

EVALUATION OF THE PROJECT

Besides the knowledge of actual fish-seed breeding operation and other ancillary activities of the Jamuna Dighi Hatchery Project, we were supposed to find out the following from the study during the course of our training programme.

1. To find out the correctness of the B.C. Ratio calculation as provided in the enclosed report of Inland Fisheries of Jamuna Dighi.

2. To ascertain the Internal Rate of Return on the basis of the Original Project Proposal of Jamuna Dighi Hatchery Project.

3. To find out the estimates of new I.R.R, and New B.C. Ratio on the basis of our field observations of the Project area.

4. Lastly, we were supposed to calculate the Net Benefit Increases (N.B.I.) to the farmer of the Project on the basis of our discussions with them.

On the basis of our actual field visit of the Project area and discussion with the small and big farmers, we arrived at the following conclusions:-

(a) As per our calculations, the Benefit Cost Ratio was found to be 1.51. (Same as that in the original report)

(b) The I.R.R. on the basis of Original Report of Jamunadighi Project is calculated as 33%.

(c) Though we visited the field site and its operations but the revised estimates of the project were not made available to us by the concerned authorities. Hence it was not possible to calculate the New B.C.R. and New I.R.R. respectively. Further it was informed by the Project authority that the production in the Project was taken on a trial basis during the year 1985-86 and 1986-87.

(d) Besides our visit to the Project area, we conducted a sample survey and contacted one small farmer and big farmer of each category of near by villages and on the basis of our interview we have calculated their Net Benefit Increase respectively for the year 1986-87.

(e) The income expenditure statement for 2 years is enclosed.

ANNEXURE - I

STATEMENT OF RECEIPTS & EXPENDITURE OF JAMUNADIGHI FISH SEED HATCHERY FOR 1985-86 & 1986-87

Receipt	1985-86	1986-87	Expenditure	1985-86	1986-87
Sale proceeds of fish seed	- Rs.100,002.00	Rs.111,033.80p	1. Inputs -	Rs.62,887.50p	Rs.47,783.80p
(Production made both years on a trial basis)			2. Capital cost (Purchase of furniture, pumpset, Cycle etc)	Rs.32,574.55	Rs.13,475.00p
			3. Other expenses for maintenancy of Hatchery	Rs.295,711.40p	Rs.418,233.63p
Total	Rs.100,002.00	Rs.111,003,80p		Rs.3,91,173,45p	Rs.4,79,492.43

MANAGING DIRECTOR
WEST BENGAL FISH SEED
DEVELOPMENT CORPN. LIMITED
62, Rose Mary Lane,

USAID SPONSORED TRAINING PROGRAMME

ON

PLANNING, IMPLEMENTATION AND EVALUATION

OF AGRICULTURAL PROJECTS

A REPORT

ON

SOYABEAN PROCESSING AT MADHYA PRADESH

Prepared by:

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S.P. Singh
N.N. Sahay
Ranvir Singh

(Participants)

SOYABEAN PROCESSING

INTRODUCTION

Development of oilseeds has been accorded a very high priority by the Govt. of India keeping in view the demand - supply gap that exists in the country. The oils extracted from the oilseeds not only constitute an important part of the human diet but also serve as an important raw material which is used in the manufacture of soaps, paints and varnishes, hairoils, lubricants, textile auxiliaries etc. The oilcakes which become available are used as cattlefeed as well as poultry feed. By exporting these oilcakes the country is able to earn the valuable foreign exchange. In addition, about 2.5 million persons find employment in milling and processing of oilseeds and oils besides several million farmers who are engaged in the cultivation of different oilseeds.

Area, Production and Productivity in India - Soyabean - In this paper an attempt has been made to study the different aspects of soyabean production & processing. The following Table indicates the trends in area, production and productivity of soyabean in India since 1972-73.

Year	Area	Production	Productivity
1972-73	0.34	0.28	819
1973-74	0.48	0.39	829
1974-75	0.67	0.51	768
1975-76	0.93	0.91	975
1976-77	1.25	1.23	988
1977-78	1.95	1.83	940
1978-79	3.06	2.93	975
1979-80	4.96	2.82	569
1980-81	6,08	4.42	728
1981-82	6.22	4.67	750
1982-83	7.68	4.91	639
1983-84	8.14	5.83	716
1984-85	12.43	9.55	768
1985-86	13.01	9.82	754

Area - Lakh hectares
Production - Lakh Tonnes
Productivity - Kgs. per hectare

It would be observed from the above table that the area under soyabean cultivation increased from 0.34 lakh hectares in 1972-73 to 6.08 lakh hectares in 1980-81 marking an increase of 1988.23% during this period. The area continued to register an upward trend and by 1985-86 reached the level of 13.01 lakh hectares. Between 1980-81 and 1985-86, the area expansion was of the order of 113.98 percent.

Similarly the production of soyabean increased from 0.28 lakh tonnes in 1972-73 to 4.42 lakh tones in 1980-81 thereby showing an increase of 1978.75 percent during this period. The production continued to maintain an upward trend since then and reached the level of 9.82 lakh tones by 1985-86. The percentage increase between 1980-81 and 1985-86 was of the level of 122.17.

In the case of productivity levels, the mixed trend was observed. It increased from 819 Kgs. per hectare in 1972-73 to 988 in 1976-77 except for a decline during 1974-75. A significant decrease in productivity level was observed in 1979-80 when the productivity level fell down to 569 kgs. per hectare. It, however, recovered thereafter but was found to be covering around 750 kgs. per hectare which was much lower than the record level of 988 kgs. observed in 1976-77.

STATEWISE PRODUCTION OF SOYABEAN IN INDIA

The following table indicates the statewise tends in production of soyabean since 1978-79 (Thousand tonnes)

State	1978-79	1979-80	1980-80	1981-82	1982-83	1983-84	1984-85	1985-86
1. Gujarat	-	-	-	8.0	4.5	4.5	4.5	4.5
2. M.P	232.0	244.8	350.0	350.0	358.6	440.3	769.6	783.1
3. Rajasthan	-	-	5.2	11.0	6.5	15.6	26.1	31.8
4. Sikkim	-	-	-	-	-	3.9	4.3	5.3
5. U.P.	60.3	36.1	81.0	97.4	117.4	117.4	148.0	155.0
6. Others	1.1	1.1	6.0	0.6	3.9	1.3	2.3	2.2
7. All India	293.4	282.0	442.2	467.0	490.9	583.0	954.8	981.9

It would be seen from the table above that M.P. has earned an important place in the country's map for the production of soyabean both as an oilseed and pulse crop. M.P. is being termed as "Soya State" in the country. The production of soyabean which stood at 232.0 thousand tonnes in 1978-79 continued to increase and in 1985-86 reached the level of 783.1 thousand tonnes thereby marking an increase of 237.5 percent during this period.

Madhya Pradesh accounted for nearly 80 percent of the all-India production in 1985-86. The state next in importance was Uttar Pradesh which had a share of 16 percent, followed by Rajasthan which accounted for 3 percent of the total production. Thus only three states viz. M.P., U.P. and Rajasthan taken together produced 99 percent of soyabean in the country. If one takes a longer period into consideration viz. 1978-79 to 1985-86. Madhya Pradesh accounted for more than 3/4ths of the country's total production of soyabean.

SOYABEAN IN MADHYA PRADESH

Soyabean crop is well established in the cropping pattern of M.P. especially in Western, Central and South Central districts of the state. The cropping pattern in M.P. during 1983-84 could be seen from the table below:

CROPPING PATTERN IN MADHYA PRADESH 1983-84

MADHYA PRADESH		UNIT THOUSAND HECTARES
1.	Raipur	Paddy 809, Lakh 189, Kodokutki 54, Linseed 51, Urad 45, Wheat 18, Moong 10.
2.	Durg	Paddy 362,Lakh 174, Kodokutki 59, Linseed 48, Urad 41, Gram 40, Wheat 21, Tur 12.
3.	Rajnandgeon	Paddy 270, Kodokutki 106, Lakh 88, Linseed 59, Gram 42, Wheat 20, Tur 17, Urad 10.
4.	Bastar	Paddy 545, Kodokutki 143, Kulthi 38, Maize 28, Nigar 20, Rapeseed Mustard 16, Sawa 15, Urad 10.
5.	Bilaspur	Paddy 665, Lakh 152, Gram 50, Linseed 39, Kodokutki 35, Wheat 24, Urad 15, Maize 11, Kulthi 10.
6.	Sarguja	Paddy 325, Maize 44, Kulthi 32, Kodokukti 30, Niger 29, Rape Mustard 27, Urad 19, Wheat 16, Sawa 14, Barley 11.
7.	Raigarh	Paddy 383, Kodokutki 38, Urad 30, Niger 24, Kulthi 20, Groundnut 13, Maize 9.
8.	Jabalpur	Wheat 158, Paddy 133, Gram 74, Kodokutki 35, Jawar 17, Musoor 17, Linseed 16, Peas 16.

MADHYA PRADESH		UNIT THOUSAND HECTARES
9.	Chindwara	Jawar 88, Wheat 81, Kodokutki 74, Soyabean 38, Urad 38, Maize 34, Tur 32, Niger 32, Gram 29, Paddy 27, Groundnut 22, Moong Moth 14, Cotton 10.
10.	Seoni	Paddy 96, Wheat 83, Kodokutki 55, Gram 27, Linseed 19, Niger 18, Jawar 17, Lakh 14, Sawa 10, Masoor 9, Soyabean 9.
11.	Balaghat	Paddy 232, Linseed 32, Wheat 21, Kodokutki 16, Urad 16, Lakh 16.
12.	Maudla	Paddy 138, Kodokutki 132, Wheat 90, Niger 36, Maize 29, Rape & Mustard 27, Gram 20, Linseed 10, Peas 10, Masoor 9.
13.	Narainghpur	Gram 100, Wheat 41, Peas 28, Tur 19, Jawar 18, Paddy 16, Soyabean 13, Lakh 11, Sesamum 11, Kodokutki 8.
14.	Sagar	Wheat 270, Gram 59, Masoor 39, Jawar 26, Linseed 16, Paddy 15, Peas 8, Soyabean 13.
15.	Demoh	Wheat 107, Paddy 51, Gram 43, Masoor 23, Jawar 19, Linseed 15, Peas 10.
16.	Penna	Wheat 87, Paddy 57, Gram 24, Linseed 21, Kodokutki 9, Jawar 9.
17.	Tikagarh	Wheat 89, Jawar 37, Paddy 30, Gram 19, Urad 19, Sesamum 11, Kodokutki 9, Barley 8.
18.	Chhatarpur	Wheat 111, Gram 59, Jawar 30, Barley 22, Paddy 21, Urad 17, Sesamum 16, Kodokutki 14, Sawa 10.
19.	Rewa	Wheat 142, Paddy 126, Gram 55, Kodakutki 47, Linseed 25, Jawar 19, Barley 11, Tur 11.
20.	Sidhi	Paddy 89, Kodokutki 67, Barley 45, Wheat 43, Gram 40, Sawa 30, Sesamum 28, Tur 27, Maize 26.
21.	Satna	Wheat 186, Paddy 89, Gram 32, Kodokutki 27, Linseed 24, Tur 16, Jawar 13, Barley 12.
22.	Shehdol	Paddy 216, Kodokutki 94, Wheat 60, Maize 29, Niger 19, Urad 18, Rape & Mustard 19, Sesamum 15, Gram 15, Tur 13, Linseed 12.
23.	Indore	Wheat 81, Soyabean 64, Gram 54, Jawar 49, Tur 11, Linseed 10, Maize 10.
24.	Dhar	Wheat 84, Jawar 76, Maize 69, Gram 68, Cotton 53, Urad 46, Soyabean 38, Groundnut 27, Mongmoth 19, Linseed 17, Paddy 11, Kulthi 9, Tur 8.
25.	Jhabua	Maize 79, Urad 61, Jawar 42, Gram 38, Kulthi 33, Paddy 29, Sawa 21, Groundnut 17, Cotton 16, Wheat 16, Bajra 11.
26.	Khargone	Jawar 180, Cotton 165, Groundnut 50, Urad 44, Maize 41, Wheat 41, Bajra 28, Mongmoth 25, Kulthi 24, Tur 22, Paddy 18, Gram 13.

MADHYA PRADESH		UNIT THOUSAND HECTARES
27.	Khondwa	Cotton 136, Jawar 122, Urad 51, Paddy 29, Wheat 26, Groundnut 19, Tur 16.
28.	Ujjain	Jawar 171, Gram 95, Wheat 71, Soyabean 52, Urad 29, Maize 20, Linseed 18, Groundnut 11, Tur 12, Cotton 11.
29.	Mondsaur	Jawar 139, Gram 137, Maize 126, Urad 108, Wheat 67, Groundnut 34, Linseed 14.
30.	Ratlam	Gram 68, Jawar 57, Urad 56, Maize 55, Wheat 36, Cotton 27.
31.	Dewas	Jowar 114, Wheat 57, Soyabean 52, Gram 43, Cotton 41, Tur 16, Maize 10, Groundnut 8.
32.	Shajapur	Jowar 152, Gram 74, Wheat 55, Soyabean 41, Sunflower 28, Groundnut 21, Maize 21.
33.	Morena	Wheat 113, Rape & Mustard 112, Bajra 68, Gram 40, Jawar 26, Tur 17, Sesamum 10.
34.	Bhind	Wheat 96, Gram 66, Bajra 36, Rape & Mustard 29, Masoor 26, Jawar 21, Tur 18, Barley.
35.	Shivpuri	Wheat 110, Jawar 61, Gram 47, Maize 27, Groundnut 19, Urad 15, Paddy 11, Linseed 10, Moongmoth 10.
36.	Gwalior	Wheat 97, Gram 44, Jowar 27, Paddy 29, Rape & Mustard 12, Tur 10.
37.	Guna	Wheat 186, Jowar 147, Gram 107, Maize 34, Moongmoth 18, Linseed 12, Soyabeen 12.
38.	Datia	Wheat 46, Gram 37, Jowar 17.
39.	Bhopal	Wheat 76, Gram 28, Jowar 17, Soyabean 9.
40.	Sehore	Wheat 121, Jowar 54, Gram 54, Soyabean 42, Tur 16, Linseed 11.
41.	Raisen	Wheat 167, Gram 88, Masoor 35, Soyabean 29, Tur 19, Lakh 16, Peas 14, Jowar 14, Sesame 14, Linseed 11.
42.	Vidisha	Wheat 254, Gram 117, Jowar 46, Masoor 25.
43.	Betul	Jowar 86, Kodokutki 68, Wheat 65, Soyabean 59, Paddy 31, Tur 29, Gram 28, Urad 22, Maize 18, Niger 12.
44.	Rajgarh	Jowar 129, Gram 44, Wheat 44, Maize 34, Tur 30, Soyabean 22, Groundnut 21, Moong 21, Cotton 20.
45	Hoshangabad	Wheat 156, Soyabean 72, Gram 53, Jowar 39, Cotton 37,Sesame 31, Tur 26, Linseed 23, Paddy 13, Lakh 12, Kodokutki 12, Maize 9.

Source: Commissioner of Land Records

The suggested cropping pattern after the introduction of soyabean crop is as under:-

Kharif	Rabi
Soyabean	Wheat
Soyabean	Gram
Soyabean	Safflower, Rapeseed, Mustard.

The districtwise recommended varieties of soyabean are as under:-

Districc-wise recommended varieties of Soyabean

Sl. No.	Name of District	Name of Soyabean varieties
1.	Sehore	Js 72-44, Js 75-46
2.	Shujapur	JS 72-44, JS 75-46
3.	Rajgarh	Punjab-1, 7105
4.	Bhopal	Durga JS 75-46
5.	Hoshangabad	Durga, JS 76-205, JS 76-201, MAC-13, JS 75-46
6.	Vidisha	Durga JS 75-46
7.	Raisen	MAC-13, 75-75, 72-46
8.	Betul	JS 72-44, 71-05, 75-46
9.	Chhindwara	71-05, Punjab-1, 75-46
10.	Seoni	72-44, 75-46, 71-05, Punjab-I
11.	Narsinghpur	72-44, 75-46
12.	Ujjain	PK 472, 72-44, 75-46
13.	Dewas	-do-
14.	Dhar	-do-
15.	Ratlam	-do-
16.	Indore	-do-
17.	Shajapur	-do-

AREA PRODUCTION AND YIELD OF SOYABEAN IN M.P.

Area Production and yield of Soyabean in M.P. for the last three years is indicated as below.

Year	Area (Lakh hectares)	Production (Lakh tonnes)	Yield (Kg ha)
1984-85	9.34	7.69	780
1985-86	10.47	7.83	750
1986-87	11.50 (estimated)	N.A.	N.A.

From the above table it is evident that yield per unit area has been stagnant although there has been an appreciable increase in area under the crop. District-wise details of area and production are given in Annexure-I.

SEVENTH PLAN STRATEGY

During the VII Plan it is proposed to increase area upto about 18 lakh hectares (1.8 Million hectares) with a target of production of 16.8 lakh tonnes. The year-wise projections are as under.

Year	Area (Lakh hectares)	Production (Lakh tonnes)
1985-86	12.09	8.5
1986-87	12.02	10.3
1987-88	13.43	11.3
1988-89	15.07	14.0
1989-90	17.80	16.8

SCOPE FOR EXPANSION

There is a lot of scope for expansion of this crop and it is expected that area by the end of the 7th Plan would be around 1.8 million

hectares. The district-wise details are given in Annexure II (a) and (b). The reasons for such an expansion could be summarized as follows.

1. Soyabean as a kharif crop is much more profitable to the farmer and yield is higher than any kharif pulse or oilseed crop.

2. It fits well under irrigated cropping pattern, wheat is successfully grown after soyabean in irrigated command area.

3. It is an assured kharif crop. It tolerates more moisture than sorghum and maize and gives more return under drought conditions.

4. It is being grown as successful inter crop with pigeon pea, sorghum and other crops.

5. It requires less nitrogenous fertilizer than any other kharif cereal crop and is able to check soil erosion when planted in fallow areas.

6. It leaves organic residue through leaf fall and yield of subsequent crop has been reported to be higher as compared to any other cereal crop used in cropping pattern.

7. It grows well in medium black heavy soil and is a relatively hard crop.

8. Besides, there is a huge potential for cultivation in the large areas of available fallow lands.

9. The Govt. policies are designed to provide the necessary support to the farmers through the price support mechanism. The following table indicates the minimum support prices fixed by the Govt. since 1977-78.

Recognizing the importance of soyabean in bridging the gap between demand and supply of edible oils on the one hand and Protein on the other, the N.C.D.C. is assisting Soyabean development projects in the states of Madhya Pradesh, Uttar Pradesh and Rajasthan. The details in this regard are as under.

SUPPORT PRICES OF SOYABEAN ANNOUNCED BY GOVERNMENT OF INDIA

Year	Rupees per quintal for FAO	
	Black	Yellow
1977-78	145	
1978-79	175	
1979-80	175	
1980-81	183	198
1981-82	210	230
1982-83	220	245
1983-84	230	255
1984-85	240	265
1985-86	250	275
1986-87	255	290
1987-88	260	300

SOYABEAN PROJECTS ASSISTED BY N.C.D.C.

State/Location	Soyabean Capacity 000 tonnes year	Rs. in Millions Bloc cost	NCDC share of assistance
Madhya Pradesh			
1. Seoni-Malwa	60.0	127.0	102.4
2. Sehore	60.0	128.9	104.5
3. Chhindwara	60.0	247.0	197.6
Uttar Pradesh			
4. Haldwani	30.0	90.9	72.7
Rajasthan			
5. Kota	60.0	220.0	176.0
Total	270.0	813.8	653.2

M.P. STATE COOPERATIVE OILSEED GROWERS FEDERATION, LTD.

The M.P. State Cooperative Oilseed Growers Federation Limited (OIL FED) was set up in October, 1979 with the broad goal of development of oilseeds and edible oils production in the state. The Federation was formed at the instance of the Govt. of India, Govt. of M.P. and NDDB as the implementing agency for national programme on "Restructuring edible oil and oilseeds production and marketing" which was designed to integrate production, procurement, processing and marketing on cooperative lines.

The objectives of the OILFED are:

1. - To organize cooperatives at village level;

2. - to ensure procurement of produce by cooperatives thereby securing premium price to growers,

3. - to develop adequate storage and processing facilities,

4. - to arrange effective marketing of the products and by-products,

5. - to impart training to farmers and also undertake research and development and its dissemination among the farmer members.

The broad organizational chart of the OILFED is as under.

Starting in limited area of three districts with about 2100 members farmers, OILFED today has about 90,000 members affiliated with 724 primary oilseed growers' societies spread over 15 districts of Madhya Pradesh. OILFED has a three tier cooperative structure with the multi-village level cooperative society at the base, a middle level comprising of a group of societies and OILFED as the apex body.

The base of OILFED's activities are the oilseed Growers' cooperative societies (OS SC) consisting of farmers growing oilseeds (Primarily soyabean) at the village level. A group of six to eight villages with an area of about 500-700 hectares are clustered together to form a primary managed by elected committees Consisting of farmer members and assisted for day to day working by a Secretary who is a paid employee of the society. The following table indicates the progress made in organizing societies and enrolling new members.

```
                                  Chairman
                                     :
                                     :
                              Board of Directors
                                     :
                                     :
                              Managing Director
                                     :
                                     :
-----------------------------------------------------------------------
 :             :
 :             :
E.D(P&T) E.D.(Finance)            E.D(Marketing) General    Senior
 :                                      :        Manager    Manager
 :                                      :        (Projects) (MIS System
 :                                      :            :          :
-------------------------------------   :            :          :
Senior   Senior   Senior   Dy     Director Manager    Manager    Junior
Manager  Manager  Manager  Mana-  (PE&E)   (Marke-    (Projects) Sustem
(I.D.)   (Proc)   (Adm)    ger             ting)          :      Analyst)
                           (pers)           :             :
------------------------------------        :             :
       :                                 Dy. Manager  Dy.Mana-
       :                                 (Marke-      ger
       :                                 ting)        (Project)
       :                              :
       :                          Senior Manager
       :                          (Finance)
       :                              :
       :                          Dy. Manager
       :                          (Finance)
       :                              :
1.   Farm Manager (Amlaha)    ------------------------------------------
                                      :                     :
2.   Farm Manager (Ujjain)            :                     :
                                   Plants            Marketing Branches
3.   Area Agronomic Centre
4.   Training Centre          1.   Sehoni-Malwa       1. Bombay
5.   Seed Testing Laboratory  2.   Sehore             2. Delhi
6.   Soil Testing Laboratory  3.   Ujjain             3. Indore
7.   Rhizobium Culture        4.   Churhat            4. Kanpur
     Laboratory               5.   Chindwara (Project)
                              6.   Morena (Project)
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	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87
No. of districts covered	3	5	6	10	15	15	15
No. of Societies	28	141	241	480	556	594	724
No. of Villages covered	269	1364	2691	4681	5327	5694	7022
No. of Members	2100	12416	21967	53960	68974	76615	88049

OILFED's main activities are in four core functional areas namely production enhancement and extension, procurement processing and marketing. A brief review of the progress is each of these functional areas is presented below.

PRODUCTION AND EXTENSION

The basic objective of this activity is to increase the income of the farmers growing oilseeds both by increasing the area under the crop as well as raising the existing low levels of yields per hectare. The farmers are encouraged to adopt improved production techniques by using improved varieties of seeds, better inputs and cultivation practices and protection against diseases with the ultimate aim of increasing yields and decreasing the vulnerability to climatic vagaries. For this OILFED arranges the supply of improved seed, fertilizers, insecticides and pesticides through its extension staff in each district. A summary in this regard between the Year 1981 and 1986 is as under.

In addition, the OILFED has also set up two District Farms at Amlaha, District Sehore and Ujjain with the objective of multiplying high quality seed and for carrying out applied research on all aspects of soyabean cultivation. The Amlaha Farm is being developed as an Area Agronomy Centre for the State under the NDDB' oilseed Restructuring project. A Rhizobium culture production centre is being established in Dhar District at the cost of Rs.52.0 lakhs with the assistance of State Govt.

DISTRIBUTION OF TECHNICAL INPUTS
YEAR OF OPERATION

Sl. Activity	1981	1982	1983	1984	1985	1986 Target)
1. Distribution of improved seed(MT)	224.15	711.62	1633.62	5000	3566	1414.18
2. Seed Treatment Chemicals(PKT)	5053	15900	31766	36633	21976 80000*	2275.8(kg
3. Culture (PKT)	1587	13900	35000	45000	24822 80000*	3595(kg)
4. P.P. Equipment(No.)	140	139	160	439	394	N A
5. Fertilizer (MT)	-	-	14767	325	518	13598
6. Pesticides (Liquid(Ltr)	16	169.35	3729	4340	5254	3661
Dust (MT)	3	28.63	165.07	240.5	-	39.8
7. Soil Sample (Analysed)	254	588	1269	1700	1295	NA
8. Demonstration(No.)	284	300	624	704	775	2123
9. Seed Villages Schemes	-	20	29	54	221	NA

*Supply made through minikits

The OILFED has a training farm at Amlaha to update the technical knowledge of the farmers and its employees. Some of the important training courses conducted and their duration is as under.

	Name of the training course	Duration
a)	M.C. Member Training	3 days
b)	Society's Secretary Training	20 days
c)	Seeds Growers Training	5 days
d)	Demonstration Growers Training	3 days
e)	Training to OILFED Staff	10 days
f)	Agricultural Officers Training	3 days
g)	Procurement Staff's Training	3 days
h)	Training for District Managers	3 days

PROCUREMENT ACTIVITIES

Soyabean is a Kharif crop and is normally harvested in October. OILFED has over the years developed a network of purchase centres. The procurement is usually done through the societies through the district offices of the OILFED. The procurement is done at the officially declared support price or the mandi price whichever is higher. This policy ensures a remunerative price to the farmers. The following table indicates the purchases made by OILFED.

DATA-DETAILS ABOUT PROCUREMENT OF SOYABEAN

Year	Quantity purchased				
Year	Procurement in tonnes	Cost in Rs.in lakhs	Average price paid per MT (Rs.)	Support price (Rs.) Black (per tonnes)	Yellow
1980-81	5014	139.29	2600	1830	1980
1981-82	10865	281.55	2580	2100	2300
1982-83	19875	547.00	2869	2200	2450
1983-84	51683	1706.31	3369	2300	2550
1984-85	70736	1892.09	2674	2400	2650
1985-86	129422	3522.25	2722	2500	2750
1986-87	141141	5772.27	4089	2550	2900

The purchases are made according to FAO specifications. Below the FAO quality is grader followed by Grade II. The price cut for Grade I is Rs.3 per quintal while that for Grade II is Rs.6 per quintal.

The total requirement in all the processing plants (47 in number) in the state is about 13 lakh tonnes as against this the present level of production is about 9 lakh tonnes. About 17 percent of the state's total production is purchase by OILFED in 1986-87.

PROCESSING

OILFED has completed erection of two solvent Extraction plants of 200 T P D capacity, out of which one was commissioned in April, 84 at

Seoni-Malwa and the second one in May, 1986 at Sehore. Both these plants are assisted by NCDC under the EEC Project Scheme. The cost of the Seani-Malwa plant was estimated at Rs.8.90 crores while that of Sehore plant was originally estimated at Rs.9.15 crores. However, taking into account the cost of escalation, the final cost turned out to be Rs.9.71 crores.

The Seoni-Malwa plant is situated at a distance of about 125 kms. from Bhopal. The plant is headed by the General Manager. He is assisted by 6 Deputy Managers, one Assistant Manager and other technical and non-technical staff. The total strength of the staff is about 70 comprising of 45 technical personnel and 25 non-technical personnel. In addition, there are about 50-60 causal employees. In the plant site there is a provision for storage of soyabean upto 2000 tonnes. Similarly there is oil storage capacity of about 700 tonnes and that of DOC storage capacity of about 4000 Tonnes.

The Sehore plant is situated at a distance of about 40 kms. from Bhopal. The plant is headed by the General Manager. He in turn is assisted by both technical and non-technical personnel. In all, there are 74 employees out of which 52 are technical personnel, the balance being non-technical staff. In addition there are 51 casual employees. In the plant site, there is provision for storage of 20,000 tonnes of soyabean and 700 tonnes for soya oil and 5000 tonnes for DOC. (Deoiled Cake).

The cost of processing at Seoni-Malwa plant was Rs. 210 per M.T. while the cost at the Sehore plant was about Rs. 181 per M.T. This shows that the Sehore plant was running more efficiently.

METHOD OF SEED PROCESSING AT SEONI-MALWA AND SEHORE PLANT

In India, bean harvesting is a manual activity and is labour intensive in nature. Most of the soyabean in the early harvesting period (November - early December) is with moisture content ranging between 12-14 per cent and this need to be reduced to level of about 10 per cent. However, the beans available from mid-December onwards have moisture content of about 9-10 per cent and do not require drying operations.

PROCESSING OF SOYABEAN SEEDS

Soyabean which is stored in the silos/godown is brought by conveyor to a seed cleaner to remove sticks, big stones, foreign materials etc. Seeds are then fed to destoner to remove small stones. Clean beans are then fed to a hot-air drier where beans are dried at around 75^{0}c. to a moisture level of 9.0%. Dried beans are than cooled and stored in tempering bins to loosen the hulls on seeds. After tempering, seeds are

subjected to cracking, where seeds & hulls are separated. Hulls are then removed by aspiration. After cracking & dehulling operation, soyabean meats are subjected to "Conditioning", where live steam is fed at a temperature of around 60^0 - 65 0^0. and to raise the moisture content a hydraulic flaking mill, where conditioned meats are converted into flakes of thickness 0.25 - 0.3 mm.

The flakes are then sent to a continuous extractor, in solvent extractions plant through conveyor whereby using normal n-Hexane, oil is extracted. The oil present in the flakes gets dissolved in the solvent and forms a mixture of solvent and oil, called "miscella" which is then passed through a series of distillation operations to separate oil and the solvent in the most optimum manner.

The meal with left-over solvent (around 30 per cent is carried over to either a Desolventiser Toaster (DT) or streamed drying tubes. In either case, the solvent is evaporated from the meal by using high temperature (110^0C) and a little vacuum. During the process of evaporation of solvent, live steam is injected to the meal which ensures retention of moisture in the meal to optimal limits. The meal after desolventisation is dried/toasted. The evaporated solvent is taken off to the condensers through a vapour scrubber where solvent vapours are washed so as to trap the fines. The desolventised and dried/toasted meal is then taken to the finishing section where it is cooled in a multistage cooler. Here the meal is restrained for sometime in each stage, agitated and hot air pulled out with the help of blower through a cyclone and dust collector. The cooled meal is then ready for bagging.

The Crude oil from solvent extraction plant is sent to storage for subsequent sale into market for manufacture of Vanaspati. Crude Soy oil contains about 2 to 3 percent gums which is a source of Lecithin. Thus a plant may comprises of degumming section to remove gums & Lecithin plant for the manufacture of lecithin from gums. The process of manufacture of lecithin involves, evaporation of moisture from Hydrated gums and cooling the resultant lecithin. Degummed oil may be sent to vegetable oil refinery, where free fatty acid content (1.5 to 2%) of oil is removed using caustic lye, bleached in bleacher to reduce colours & deodorised to remove undesirable flavour. The refined oil is then sold to consumers after packing in consumer packs.

The extracted meal is used for two purposes, depending upon the type of pre-processing steps taken in processing of soy seeds. In case the extracted meal is required for use as feed for live stock, hulls content can go up to 5 to 6 per cent & thus hull separation step is not be necessary. However, Ureas activity is controlled to a maximum of 0.2 controlling heating parameter in toaster. If the extracted meal is required for human consumption, damaged seeds, stone etc. are separated, hulls are removed using hull removal system to a maximum & the extracted meal is fed to dryer instead of toaster to remove solvent, where [DI is also maintained. The extracted meal prepared for human consumption is used for manufacture of value added down stream products such as edible

flour, Texturised Soy Proteins (TSP), Protein concentrate and isolates. TSP is manufactured by passing the soy flour through extruders where a number of parameters like steam heat etc. are controlled.

The above processing mechanism could be better explained with the help of a flow chart which is shown in the Case Report of OILFED.

A comparative picture in respect of Seoni-Malwa plant and Sehore plant relating to a few selected parameters could be seen from the following table. (Processing Performance Report)

E. MARKETING ACTIVITIES

OILFED's main products are Solvent Soya Oil, Refined Soyabean oil and Deoiled Soya meal and now Vanaspati, Solvent soya oil is normally sold in bulk to other Refiners or to manufactures of Vanaspati. With OILFED's own Vanaspati plant going on stream in Churhat, a proportion of the solvent soya oil produced at our Seoni-Malwa and Sehore plants will be earmarked as solvent soya oil, until we develop further refining capacity.

Refined soya oil is gaining increased acceptability for its high nutritive and health value, particularly, as it is favourably priced relative to other edible oils. Soya oil's disadvantage of relatively short shelf life and apprehensions of some problems of odour is expected to be fully overcome by the modern processing plant established by OILFED at Ujjain. Beginning June 1987, OILFED expects to market Refined soya oil, initially in northern and western India, in consumer flexi-packs of 1 kg, 500 gms as well as traditional packings. Our objective is to provide a high quality edible oil that is available to consumers even in the lower income ranges, in small packages that do not call for a large expense on one purchase.

Deoiled soya meal has a large export market, but India produces only a little over 1% of the world's total production of meal. OILFED has been exporting soya meal since September 1981, and is now the leading exporter of this commodity from India. In 1985-86 sales were 85,000 MT with a value of RS. 18.5 crores. This will increase dramatically in 1986-87 with the commissioning of the Ujjain plant and we expect to export nearly 2,00,000 MTs valued over Rs. 40 crores.* Our markets include East Europe, Middle East and Algeria and OILFED is rapidly expanding its expertise in the soya meal export trade.

PROCESSING PERFORMANCE REPORT

Sl. No.	Particulars	Year	Seoni-Malwa	Sehore
1.	Soyabean processed (MT)	1984-85	50685.21	-
		1985-86	52926.46	20996.52
		1986-87	22707.49	24343.07
2.	Crude oil	1984-85	9058.47	-
		1985-86	9340.31	3670.12
		1986-87	3989.15	4277.34
3.	DOC	1984-85	41870.93	-
		1985-86	44080.51	17336.35
		1986-87	18783.59	19935.37
4.	a) Direct Expenses (lakhs)	1984-85	87.72	-
		1985-86	79.60	46.48
		1986-87	34.55	36.96
	b) production overhead	1984-85	15.25	-
		1985-86	20.99	5.43
		1986-87	11.02	6.31
	c) Administrative overhead	1984-85	4.88	-
		1985-86	16.79	8.38
		1986-87	8.09	5.80
5.	processing Cost/ MT (Rs.)	1984-85	173.06	-
		1985-86	150.40	221.42
		1986-87	221.89	173.67

With the commissioning of the Churhat Vanaspati plant in July, 1986, the sale of our "pasand" vanaspati in 15 kg packs has already begun. Consumer packaging is expected to be marketed by June 1987* and our target for 1986-87 is 24,000 MT of which 45 to 50% will be Madhya Pradesh and the rest in northern and eastern regions of the country.

The selected data relating to sales of crude oil refined soyabean oil, Deoiled cake and Vanaspati for the year 1984-85 to 1986-87 is presented in the following table

OTHER PROJECTS

Under NDDB assistance an ultra-modern 400 TPD soyabean complex at Ujjain is also ready for commissioning and trial runs are under progress. The Refinery has been commissioned in the month of July, 1986 and the Solvent Extraction plant has commenced production in January, 1987. This Plant also has a 40 TPD plant for the production of Soya flour from the Deoiled meal left over from the solvent oil extraction, as well as a Lecithin plant. The entire Ujjain complex is perhaps the largest integrated soyabean processing complex in the cooperative sector in India.

OILFED has also set up a 100 MT per day production Vanaspati plant at Churhat in district Sidhi. The plant is one of the most modern in the country and its production comparable to the leading market brands such as Dalda and Rath.

OILFED is continuing to expand its processing and production facilities and projects in hand or under consideration include:

NEW PROJECTS UNDER IMPLEMENTATION

1. <u>Mustard/Rapeseed Expeller Project-Bhind-Morena</u>

Total outlay - Rs. 2.5 crores

Projected date of completion - April 1988

This project is financed by NDDB and will be located at Jarerua village in Morena district. This plant would produce high grade mustard oil at 38 tons per day which would be marketed in crude and consumer packing.

Year	Crude Oil Qty.	Value	Refined Soyabean Qty.	Value
1984-85	11643.45	1364.53	1625.35	196.37
1985-86	11682.99	2361.46	1329.80	166.24
1986-87	4372.85	753.52	744.96	120.57

Year	Deoiled Cake Export Qty.	Value	Inland Qty.	Value	Vanaspati Value
1984-85	40640.90	773.10	11369.00	227.43	
1985-86	65585.01	1694.83	14429.84	1451.26	362.35
1986-87	26288.99	645.39	3275.75	730.00	280.20

1. Value figures are given in lakhs (Rs)

2.* Figures included in export sale

3. 1986-87 figures are upto March 1987 only.

4. The year of OILFED starts from Oct.

2. Solvent Extraction Plant-Chhindwara

Total outlay - Rs.24.7 crores

projected date of completion - April 1988

This project is being set up in Chhindwara district and is being financed by the World Bank through NCDC. A 200 TPD Solvent Extraction plant is proposed and will utilize the soyabean from OSCS in Chhindwara, Seoni and Narsinghpur.

EXPANSION OF EXISTING PROJECTS

100 TPD Refinery at Sehore : Estimated cost Rs.5 crores.

The market for soyabean oil in the future is tending towards the refined oils and keeping with the consumers shift towards refined oil,it is envisaged that a 100 TPD refinery be set up at Sehore so that the crude soyabean oil being produced at Seoni-Malwa and Sehore could be refined and sold as 'Refined Oil'.

Downstream Soya Products : In view of the high quality protein in soyabeans and the versatility of presenting this proteins in various acceptable food forms available through modern technologies, OILFED also plans to diversify into the marketing of soya flour, texturised vegetable proteins and soya butter. Detailed project reports are being prepared.

FINANCIAL ASPECTS

Oilfed is financed by share capital loans and grants from the State-Government, National Dairy Development Board and National Cooperative Development Corporation.

During the period Oilfeds's sales turn over increased manifold from Rs. 841.101 lakhs to Rs. 3,524.93 lakhs in 1984-86. In 1980-81, 1981-82 and 1982-83 oilfed paid out of its income, an amount of Rs. 1,02,95,403/- as price difference to its member societies, thus reducing the profits. In 1983-84 and 1984-85, consequent upon the commissioning of other plants, large deductions were made on account of investment allowance and initial depreciation, with the result that OILFED ran into accounting loss. A depressed market in 1984-85 further increased the margin of losses. However, 1985-86 has been a very good year and has earned a net profit of Rs. 1.75 crores, after providing for interest and deficit. In addition, reimbursement of losses on account of price support operations to the extent of Rs. 2 crores are due to the OILFED from the Government of India and the State Government and after this is received OILFED should have more or less wiped off accumulated losses and be in a position to earn net profits regularly.

The participants had a discussion with Shri Ram Karan and other farmers in village Bhagwara and discussed with them the farm economics before the advent of soyabean and also with soyabean. The Comparative picture in regard to the above 2 alternatives is as under.

Comparative Profitability of a farmer

Name of the farmer - Shri Ram Karan
" " " Village-Bhagwara
" " " District-Hoshangabad
Land Available - 15 Acres

Cropping Pattern before the advent of Soyabean-Alternative A

Jowar	- 2 Acres
Kodan	- 1 Acre
Til	- 3 Acres
Tur	- 3 Acres
Fallow Area	- 6 Acres

FARM INCOME

Crops	Area (Acres)	Production (in Qtls.)	Price (Rs. per quintal)	Total Income (Rs)
Jowar	2	4	150	600
Kodan	1	1	200	200
Til	3	2	1,000	2,000
Tur	3	3	550	1,650
Fallow	6	-	-	-
Total	15	10		4,450

Crops	Cost of Production (Rs. per Acre)	Area (Acres)	Total Cost (Rs.)
Jowar	165	2	330
Kodan	100	1	100
Til	300	3	900
Tur	150	3	450
Fallow	-	6	-
		Total	1780

Net Income - 4450-1780 = Rs. 2670

Cropping Pattern with Soyabeans - Alternative B.
Jawar - 1 Acre
Soyabean - 14 Acres.

FARM INCOME

Crop	Area (Acres)	Production (in quintals)	Price Rs. per (quintal)	Total Income (Rs.)
Jawar	1	2	150	300
Soyabean	14	50	450	22500
			Total	22800

Crops	Cost of Production (Rs. per acre)	Area (Acre)	Total Cost (Rs.)
Jawar	165	1	165
Soyabean	800	14	11200
			= 11,365
			= 11,435

Net Income = 22800 - 11365
Net Income under Alternative A - Rs. 2670
Net Income under Alternative B - Rs. 11435
Incremental Income = Rs.8765 (Net Benefit Increase)

To sum up, it would be seen from the above analysis and the foregoing discussion that assured price, proper arrangement for marketing/of soyabean has helped the farmers and improved their economic conditions. In fact the introduction of soyabean and its marketing arrangement especially has proved to be been for the farmers' community and they are fully satisfied with the present arrangement.

ANNEXURE - I

AREA AND PRODUCTION UNDER SOYABEAN IN MADHYA PRADESH (Districtwise) - 1984-85

Sl. No.	District	Area in (000 hectare)	Production (000 tonnes)
1.	Raipur	1.4	1.3
2.	Durg	0.6	0.3
3.	Rajnandgaon	0.9	0.6
4.	Bastar	0.2	0.1
5.	Bilaspur	0.6	0.4
6.	Raigarh	0.2	0.1
7.	Sarguja	0.2	0.1
8.	Jabalpur	4.8	2.6
9.	Mandla	0.7	0.3
10.	Balaghat	0.5	0.3
11.	Chindwrara	53.1	82.7
12.	Seoni	20.8	12.7
13.	Narsinghpur	21.9	20.5
14.	Sagar	30.2	21.1
15.	Damoh	2.6	1.6
16.	Panna	0.8	0.5
17.	Chattarpur	6.8	3.1
18.	Tikamgarh	3.1	6.9
19.	Rema	30.2	0.6
20.	Satna	2.6	1.7
21.	Shahdol	0.8	0.1
22.	Sidhi	3.1	0.2

Contd...

Sl. No.	District	Area in (000 hectare)	Production (000 tonnes)
23.	Indore	87.5	76.2
24.	Dhar	65.4	59.4
25.	Jhabua	7.2	3.0
26.	Khargone	10.0	4.8
27.	Khandwa	5.7	2.7
28.	Ujjain	102.5	73.9
29.	Ratlam	15.4	10.4
30.	Mandsaur	9.0	6.8
31.	Dewas	91.8	72.9
32.	Shajapur	71.2	54.9
33.	Bhopal	15.5	10.1
34.	Sehore	67.1	47.7
35.	Raisen	40.3	26.2
36.	Vidisha	11.6	8.2
37.	Raigarh	42.9	29.3
38.	Betul	63.1	39.2
39.	Hoshangabad	102.5	69.7
40.	Morena	0.6	0.6
41.	Bhind	0.3	0.2
42.	Gwalior	3.9	5.4
43.	Datia	2.8	2.1
44.	Guna	12.8	8.2
45.	Shivpuri	2.5	1.4
	Total	934.0	769.5

ANNEXURE - II (A)

AREA AND PRODUCTION PLAN OF COMING FIVE YEARS

A. Area (Unit in '000 ha)

		1985-86	1986-87	1987-88	1988-89	1989-90
1.	Raipur	3.8	5.7	9.0	10.0	23.0
2.	Durg	2.0	4.0	8.0	10.0	20.0
3.	Rajnandgaon	4.4	7.0	17.0	20.0	22.0
4.	Bastar	5.0	6.0	9.0	13.0	17.0
	BASTAR	16.1	22.7	43.00	53.00	82.00
5.	Bilaspur	3.0	8.0	12.0	15.0	21.0
6.	Raigarh	2.5	5.5	7.0	12.0	15.0
7.	Sarguja	2.5	5.7	9.0	15.0	21.0
	BILASPUR.DN	8.0	19.2	28.0	42.0	57.0
8.	Jabalpur	6.0	8.5	12.5	15.0	20.0
9.	Mandla	2.0	5.0	9.0	14.0	19.0
10.	Balaghat	2.5	5.0	9.0	13.0	17.0
11.	Chhindwara	58.0	59.0	60.0	61.0	66.0
12.	Seoni	20.0	25.0	30.0	34.0	41.0
13.	Narasinghpur	24.0	28.0	31.0	33.0	39.0
	JABALPUR DN	112.5	130.50	151.50	170.0	202.0
14.	Sagar	37.0	39.0	41.0	43.0	45.0
15.	Damoh	5.0	9.5	11.5	13.0	25.0
16.	Panna	14.0	17.7	19.0	21.0	25.0
17.	Chatarpur	5.0	9.0	17.0	20.0	23.0
18.	Tikamgarh	18.0	20.0	25.0	27.0	30.0
	SAGAR DN	79.0	95.0	113.5	124.0	148.0
19.	Rewa	3.8	7.0	11.0	14.0	29.0
20.	Satna	7.0	9.0	14.0	17.0	29.0
21.	Shahdol	7.0	9.0	13.0	19.0	20.0
22.	Sidhi	5.0	10.0	17.0	20.0	23.0
		22.8	35.0	55.0	70.0	101.0

Contd..

A. Area (Unit in '000 ha)

		1985-86	1986-87	1987-88	1988-89	1989-90
23.	Indore	75.0	77.0	80.0	84.0	85.0
24.	Dhar	50.0	85.0	60.0	64.0	69.0
25.	Jhabua	13.5	17.0	27.0	32.0	39.0
26.	Khargone	9.0	14.0	18.0	25.0	38.0
27.	Khandwa	3.0	7.0	9.0	12.0	18.0
	indore dn	151.0	200.0	194.0	217.0	249.0
28.	Ujjain	77.0	79.8	84.0	87.0	90.0
29.	Ratlam	20.0	25.0	28.0	38.0	46.0
30.	Mandsaur	58.0	60.0	64.0	77.0	85.0
32.	Shajapur	14.0	18.0	28.0	30.0	32.0
	ujjain dn	203.0	261.0	288.0	319.0	341.0
33.	Bhopal	17.0	19.0	22.0	25.0	38.0
34.	Sehore	60.0	65.0	70.0	75.0	79.0
35.	Raison	44.0	46.0	49.0	50.0	58.0
36.	Vidisha	31.0	35.0	39.0	42.0	45.0
37.	Rajgarh	42.0	45.0	50.0	53.0	65.0
38.	Betul	81.0	83.0	84.0	85.0	87.0
	BHOPAL DN.	275.0	293.0	314.0	330.0	367.0
39.	Hoshangabad	83.0	85.0	89.0	92.0	94.0
	HOSHANGABAD DN	83.0	85.0	89.0	92.0	94.0
40.	Morena	2.8	9.0	10.0	13.0	18.0
41.	Bhind	1.4	8.0	12.0	15.0	26.0
	MORENA DN	4.2	17.0	22.0	28.0	44.0
42.	Gwalior	3.2	7.5	7.0	14.0	27.0
43.	Datia	1.5	3.0	4.0	8.0	18.0
44.	Guna	17.0	27.0	27.0	30.0	32.0
45.	Shivpuri	3.0	6.0	6.0	10.0	18.0
	GWALIOR	24.7	43.5	44.0	62.0	85.0
	GRAND TOTAL	1,209.3	1202.0	1342.5	1507.0	1780.0

ANNEXURE II (B)

B. PRODUCTION IN MT

Sl.No	District	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Raipur	3040.0	4845	8000	9500	23000
2.	Durg	2320.0	3400	7200	9500	20000
3.	Rejnandgaon	3520.0	5950	15300	19000	22000
4.	Bastar	4000.0	5100	8100	12350	17000
	RAIPUR DN	12880.0	19295	38700	50350	82000
5.	Bilaspur	2400.0	6800	10800	14250	21000
6.	Raigarh	2000.0	4675	6300	11000	14000
7.	Sarguja	2000.0	4845	8100	14000	21000
	BILASPUR	6400.0	16320	25200	39250	57000
8.	Jabalpur	4800.0	7225	11000	14200	20000
9.	Mandla	1600.0	4250	8200	13000	19000
10.	Balaghat	2000.0	4250	8000	12500	17000
11.	Chhindwara	46400.0	50150	54000	57800	66000
12.	Seoni	16000.0	21250	29000	32500	41000
13.	Narsinghpur	19200.0	23800	26000	3000	39000
	JABALPUR DN	167600.0	110925	136200	160000	202000
14.	Sagar	29600.0	33150	36900	40850	45000
15.	Damoh	4000.0	8075	11000	12350	25000
16.	Panna	11200.0	15045	17130	19900	25000
17.	Chatarpur	4000.0	7650	15300	19000	23000
18.	Tikamgarh	14400.0	17000	22500	25600	30000
	SAGAR DN	63200.0	80920	102830	117700	14800
19.	Rewa	3040	5950	9900	13500	29000
20.	Satna	5600	7950	12500	16100	29000
21.	Shahdol	5600	7950	12000	18000	20000
22.	Sidhi	4000	8500	15300	19000	23000
	REWA DN	18240	30350	49400	66600	101000

Contd...

Sl.No	District	1985-86	1986-87	1987-88	1988-89	1989-90
23.	Indore	60000	64450	72000	79000	85000
24.	Dhar	40000	72750	54000	61000	69000
25.	Jhabua	10800	14450	24500	31000	39000
26.	Khargone	7200	11900	16200	17000	38000
27.	Khandwa	2400	5950	8100	11000	18000
	INDORE DN	30400	169500	174800	199000	249000
28.	Ujjain	61600	67150	75600	82000	90000
29.	Ratlam	16000	21250	25200	36000	46000
30.	Shajapur	11200	15300	25200	28500	85000
31.	Dewas	60800	76150	65600	82650	88000
32.	Mandsaur	46400	51000	57600	73150	32000
	UJJAIN DN	196000	221850	258200	352[illegible]	341000
33.	Bhopal	13600	16150	19800	23750	38000
34.	Sehore	48000	55250	63055	71000	79000
35.	Raisen	35200	39100	45000	47500	58000
36.	Vidisha	24800	29750	32000	59900	45000
37.	Rajgarh	33600	38250	45000	50000	65000
38.	Betul	64800	70500	73600	80000	87000
	BHOPAL DN	220000	259000	281455	332150	372000
39.	Hoshangabad	66400	72250	80000	87500	94000
40.	Morena	2240	7650	80000	87500	94000
41.	Bhind	1120	6800	10800	14500	26000
	MORENA DN	3360	4450	19800	26850	44000
42.	Gwalior	2560	6375	6300	13250	17000
43.	Datia	1200	2550	3600	7300	18000
44.	Guna	13600	22950	24300	28500	32000
45.	Shivpuri	2400	5100	5400	9500	18000
	GWALIOR	19760	36970	39600	58850	85000
	GRAND TOTAL	858480	1031835	1127185	1403050	1681000

USAID SPONSORED TRAINING PROGRAMME

ON

PLANNING IMPLEMENTATION AND EVALUATION

OF AGRICULTURAL PROJECTS

(APRIL 20 MAY 15, 1987)

PROJECT FOR RECLAMATION OF SALINE AND ALKALI SOILS IN UTTAR PRADESH

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-Participants

PROJECT FOR RECLAMATION OF SALINE AND ALKALI SOILS IN UTTAR PRADESH

C O N T E N T S

PROJECT FOR RECLAMATION OF SALINE AND ALKALI SOILS IN UTTAR PRADESH

1. INTRODUCTION

1.1 It is estimated that there are about 7.0 million hectares of salt affected lands with alkali soils in about 2.5 million hectares. The alkali affected soils occur in chronically flood prone Indo Gangetic basins in the states of Uttar Pradesh, Punjab and Haryana. Uttar Pradesh alone has 1.2 million hectares of saline/alkali (USAR) soils accounting for 17 per cent of the total salt affected area in the country.

1.2 The National Flood Commission observed that these soils have extremely low or nil infilteration rates and associated with high water table conditions. Since these soils do not "drink water" the major portion of the rainfall moves as surface run-off or stagnates in depressions causing drainage congestions. The run-off contributes to the flood, the water logged areas serve as ideal breeding grounds for insects and pathogens and help to spread diseases like malaria. The National Flood Commission, therefore, recommended large scale reclamation of alkali soils in the Indo- Gangetic basins to reduce the drainage congestion and moderate floods. In the process the water logging can also be removed and health hazards will be minimized.

1.3 In the saline soils crop growth becomes difficult due to excess of soluble salts and in alkali soils due to action of exchangeable sodium. If these soils are reclaimed scientifically, they have a tremendous potential. Techno-economically viable technologies have been evolved on the basis of research conducted at Central Soil Salinity Research Institute, Karnal, Agricultural Universities etc.

1.4 At this stage of agricultural development when the horizontal extension of area under cultivation has almost reached the dead end, the reclamation and utilization of degraded lands particularly salt affected (USAR) areas is becoming increasingly essential for increasing production of food, fodder, fuel etc. in view of increasing human and animal population.

2. BACKGROUND

2.1 Government of U.P. had been in the last few years, providing gypsum/phyrite at 75 per cent subsidized prices to the farmers and about 1.0 lakh hectares land had been treated with soil reclaiming amendments, but the programme could not make impact and the achievements could not be to the expected extent. Similarly, U.P. Land Development Corporation had also treated an area of 6,840 ha. by application of gypsum/pyrite. It was seen that the application of soil amendment alone

cannot treat the usar lands unless a complete package of technology is applied.

2.2 Last Year, Sarvodaya Ashram at Sikanderpur in Hardoi district had taken up reclamation of Usar lands in two villages over an area of 30 ha. They are reclaiming this area for crop cultivation in 20 ha and farm forestry over an area of 10 ha. They have adopted gypsum technology alongwith on farm development like land preparation, leading, incorporating green manure, crop management etc. It is reported that in the first year itself the farmers have raised paddy crop in kharif and wheat in rabi season. The maximum yield obtained by a farmer in Sikanderpur village was told to be 50 quintals/ha. of paddy crop. However, the average yield of paddy was 40 quintal/ha and that of wheat 18 quintals/ha from barren/usar lands distributed to landless labourers. These lands were producing nothing before reclamation.

2.3 Govt. of U.P. is now implementing a centrally sponsored scheme for Reclamation of Alkali Soils (USAR) from 1987-88. It is proposed to reclaim an area of 10,785 hectares during the year 1987-88 with complete package of technology. Under the scheme subsidy is provided to farmers on gypsum/pyrite @ Rs. 4500/- per ha; free boring @Rs. 3000/- per unit area of 4 hect. supply of free Green manure seed @ Rs. 200/- per ha. The amount of subsidy is shared equally by Central Govt. and State Govt.

2.4 It would not be possible to reclaim more than 35,000 ha of

Usar lands in U.P. during Seventh Five Year Plan with the existing level of budgetary resources in the Central and State Plans. With these humble efforts and the present pace, it would take about 100 years to reclaim 12 lakh ha of existing salt/alkali affected soils spread in 34 districts of U.P. It is, therefore, essential to supplement the financial resources by availing external assistance preferably from World Bank to complete the gigantic task over a period of 8 years i.e. by the end of Eighth Five Year Plan (1995).

2.5 The Usar lands generally belong to small and marginal farmers who are allottees of the surplus or community lands. These farmers were landless labourers before they got the land rights. The estimated Usar lands owned by individual farmers is about 7 lakh ha. The community or Panchayat lands accounts for 5 lakh ha of the total Usar lands. The size of land holdings of a farmer is about 0.5 ha. The income of the farmer from these lands is very less, However, they may be getting wages as farm labourers. With this socio economic resource base, it is impossible for these farmers to get even food for subsistence from these lands. Thus providing food for these families is the immediate need.

2.6 In U.P. the total fertilizer consumption during 1984-85 was 16.13 lakh tonnes and per hectare consumption was 65.11 kgs. as against the national average of 43.55 kgs/ha. The total consumption of electricity

for agricultural purposes was 3443 GWH during 1982-83 which comes to 34.98 per cent of the total electricity consumption in the state. The short term, medium term and long term agricultural loans advanced by the cooperatives during 1984-85 was Rs. 221.12 crores, Rs. 30.15 crores and Rs. 72.03 crores respectively. The total loans advanced during the year 85-86 was Rs. 323.30 crores.

2.7 In addition to generation of income and food for these socio-economically backward farmers, the project aims at generating additional employment opportunities and redistribution of income. This will also result in poverty alleviation.

3. PROJECT AREA

3.1 The project is proposed to be implemented in 34 districts of U.P. where the Usar lands are found. The district wise area under Usar is given at annexure-I. The 16 districts of Lucknow, Agra and Allahabad Division has an estimated area of 6.48 lakh hectares which is about 54 per cent of the total Usar areas in the state.

3.2 The Indo-Gangetic plains are alluvial in nature with sandy loam to loam in texture. Topography of this area is mostly levelled with slopes less than 1 per cent. P H of these soils varies from 9 to 10.5. The surface soil is impermeable to water and often hard kankar pan is found at some depth in the sub-soil. The EC is 5-15 mm hos/cm and ESP 45 to 65. The water table is generally below the root zone except in the vicinity of the major canals. The underground water is generally of good quality and is fit for irrigation. It would be appropriate to organise soil survey in each district to know about the parent material, soil characteristics, slope characteristics, hydrology, soil reaction etc.

4. THE PROJECT

4.1 The objective of the project is to reclaim 12 lakh hectares of Usar lands spread over 34 district of U.P. so as to make these lands fit for crop production, social forestry in order to make available food, fodder and fuel for the small and marginal farmers who are the allottees/of such lands. The project will also generate employment potential for agricultural labourers who will work for reclamation of community lands. The process of reclamation will also help to control floods, remove drainage congestions, reduce health hazards. This will also help the process of poverty alleviation by providing additional income to landless labourers, small and marginal farmers. Further, it will help to improve environment.

4.2 TECHNOLOGY

4.2.1 The Central Soil Salinity Research Institute, Karnal and C.S. Azad Agricultural University Kanpur have perfected the technology for reclamation of Usar soils. The important components of the technology are:-

(a) <u>On farm development</u>: This includes land levelling, land shaping, bunding, construction of field channels, drains etc. wherever necessary. The estimated cost for the on farm development is about Rs. 1500/- per ha during the first year. The process of on farm development would involve approximately 120 mandays for one hectare.

(b) <u>Creation of irrigation facilities</u>: Surface drains in conjunction with vertical drainage through a chain of shallow tube wells in the Usar areas is important. This will help in removing excess salts through leaching fields and would also provide an assured source of irrigation. It would require boring costing about Rs. 4,800/- which includes pipe and labour for a 10cm diameter and .30 m deep bore. The price of a diesel pumpset of 5.0 H.P. is about Rs. 7,500/-. The cost of construction of a delivery tank is about Rs. 1000/-. Thus the total cost of installation of a diesel pumpset comes to Rs. 13,300/-. This pumpset can irrigate an area of about 4.0 ha.

(c) <u>Application of soil amendment</u>: The quantity of soil amendment required depend on sulphur content, texture of the soil, P H and the rapidity with which the reclamation is planned. In general about 8 to 15 tonnes of mineral gypsum or other amendment is required. The amendment should be evenly applied to the depth of 10 cm of soil. The cost of 8 tonnes of gypsum/pyrite application is about Rs. 4,500/- per ha. A subsidy at 75 per cent of the cost of amendment is available under the centrally sponsored scheme which is shared equally by Central Government and the State Government. The details of subsidies available under the centrally sponsored scheme are at Annexure-II.

(d) <u>CROP PRODUCTION</u>: Selection of crops and crop varieties is important for success of any Usar reclamation programme. The crops selected should be those which require frequent irrigation since it is expected to improve the alkali soils. The crops and crop varieties should also be alkali tolerant. In the first 2-3 years rice crop should be raised in the kharif season. In rabi season, wheat should be grown although the yield is low, since it is semi-tolerant to alkali and also needs frequent watering. In case of reclamation of community lands, Berseem/sugarcane should be grown as it will help faster reclamation of sub-soils. They can also go for fodder crops like "Subabul" plantation. Even aromatic plants like Khus and Lemon grass, Pamarosa etc, tolerant to the salt can

also be grown successfully. The relative tolerance of some crops and grasses to exchangeable sodium is given below:

Tolerant crops		Semi-tolerant	Sensitive
1.	Kamel grass	Wheat	Cowpea
2.	Rhodas grass	Barley	Gram
3.	Para grass	Moth	Groundnut
4.	Barmuda grass	Sangi	Lentil
5.	Dhencha	Raya	Moong
6.	Rice	Berseem	Peas
7.	Sugarbeet	Sugarcane	Maize
		Bajra	
		Cotton	

The cost of rice and wheat crop production in one year over an area of one hectare is Rs. 2650/- and Rs. 2750/- respectively. The detailed cost of crop production is given at annexure-III.

4.3 PROJECT COST

The reclamation process of " Usar" soils has got number of treatment to be taken up in an integral manner. One of the components i.e. pump set & tube well has got its capacity to provide service for a total area of 4 hectares. Hence while preparing the project the unit area of 4 hect. has been taken into account.

(i) <u>The unit cost for area where electricity is available</u>:

		Rs.
a)	Cost of levelling, bunding & initial ploughing (@ Rs. 1500/- per hectare)	6,000
b)	<u>Irrigation System-</u>	
	i) Cost of boring & material (10 cm. diameter-30 m. deep)	4,800
	ii) Cost of electric pumpset (5 H.P.)	6,000
	iii) Cost of delivery tank	1,000
	iv) Cost of pump house	4,500
c)	Cost of soil amendments	17,600
d)	Application of soil amendments	400
e)	Cost of green manuring	800
f)	Cost of crop production (Paddy & Wheat)	21,600
	Total ..	62,700

(ii) The unit costs for area where electricity is not available:

		Rs.
a)	Cost of levelling, bunding and initial ploughing	6,000
b)	<u>Irrigation system</u>	
i)	Cost of boring and material (30m depth)	4,800
ii)	Cost of delivery tank	1,000
iii)	Cost of diesel pumpset (5 H.P.)	7,500
c)	Cost of soil amendments	17,600
d)	Application of soil amendments	400
e)	Cost of green manuring	800
f)	Cost of crop production (Paddy & Wheat)	21,600
	Total:	59,700

(iii) The unit cost for area where assured irrigation is available:

		Rs.
a)	Cost of leveling, bunding and initial ploughing	6,000
b)	Cost of soil amendment	17,600
c)	Application of soil amendments	400
d)	Cost of green manuring	800
e)	Cost of crop production	21,600
	Total:	46,400

4.4 IMPLEMENTING AGENCIES

Out of the total of 12 lakh ha. of Usar lands in U.P., 5 lakh ha are community lands and 7 lakh ha are farmers land. It is proposed that Department of Agriculture, Government of U.P. with their staff would work on farmers lands. The community lands will be acquired on lease by the U.P. Land Development Corporation for reclaiming these lands which will be returned back to the village panchayats for distribution among landless cultivators.

4.5 FUNDING AGENCIES

The total cost of reclamation of 12 lakh hectares of Usar lands comes to Rs. 1209 crores. At the rate of subsidy available in the existing centrally sponsored scheme for reclamation of Usar lands the total amount of subsidy amount to be borne by Govt. of India and State Govt. comes to Rs. 486.0 crores. This amount will be shared equally by Govt. of India and State Govt. The balance of Rs. 723 crores have to be arranged as loan from World Bank.

4.6 PHYSICAL TARGETS

It is proposed to reclaim the entire 12 lakh ha. of Usar lands in U.P. over a period of 8 years. The agencywise targets are given below:

Yearly Targets. (in lakh hectares)

	Deptt. of Agri	U.P. Land Dev. Corpn.
1987-88	0.44	0.31
1988-89	0.58	0.42
1989-90	0.73	0.52
1990-91	1.02	0.73
1991-92	1.02	0.73
1992-93	1.02	0.73
1993-94	1.02	0.73
1994-95	1.17	0.83

4.7 ECONOMIC ANALYSIS

It has been observed that the total cost of reclamation of 4 ha of Usar land and raising paddy crop in kharif season and wheat in rabi in the first year comes to Rs. 22,400/- and the gross income accruing to the farmers comes to Rs. 22,200/-. Thus the net income comes to Rs.-200. Considering the loan, interest, and subsidies, the net surplus is Rs.- 24,300/-. In the second year the net income accruing to the farmer is Rs. 5928. In the first year the net surplus is negative, but it turns positive from the 2nd year. From the IIIrd year to IX year the net income is Rs. 11,848/- per year. After repaying the loan instalment and the interest on loan, the net surplus comes to Rs. 8088/- per year.

The detailed cost-benefit Analysis for a unit of 4 ha area is given at annexure-IV.

The Cash Flow, Benefit Cost Ratio and IRR for a unit of 4 ha. are given at annexure- V. The B.C. ratio worked out is 1.20 and the IRR is 29.88%. It may, however, be mentioned that the cost of establishment i.e. staff component has not been included assuming that the additional staff that would be recruited under T & V programme and existing staff of the Deptt. of Agriculture would be able to implement the project.

The year-wise physical target and financial requirement is given at annexure - VI.

ANNEXURE-I

WASTE USAR LAND IN THE DISTRICT OF UTTAR PRADESH

Sl.No.	Name of Districts	Waste Usar area in Hect.
1.	Azamgarh	32,045
	Total: Gorakhpur Division	32,045
2.	Lucknow	25,515
3.	Unnao	48,638
4.	Rae Bareli	59,800
5.	Sitapur	19,932
6.	Hardoi	35,535
7.	Lakhimpur-Kheri	24,083
	Totai: Lucknow DIvision	2,13,503
8.	Faizabad	26,599
9.	Sultanpur	42,577
10.	Pratapgarh	31,685
11.	Barabanki	23,966
	Total: Meerut Division	1,24,827
12.	Saharanpur	12,022
13.	Muzaffarnagar	19,763
14.	Meerut	15,748
15.	Ghaziabad	20,439
16.	Bulandshahr	32,345
	Total: Meerut Division	1,00,317
17.	Aligarh	45,057
18.	Mathura	12,563
19.	Agra	25,049
20.	Mainpuri	66,752
21.	Etah	56,027
	Total: Agra Division	2,05,448
22.	Farrukhabad	49,499
23.	Kanpur	78,128
24.	Etawah	42,328
25.	Fatehpur	41,937
26.	Allahabad	68,232
	Total: Allahabad Division	2,30,124

Contd...

Sl.No.	Name of Districts	Waste Usar area in Hect.
27.	Bareilly	18,588
28.	Badaun	25,283
29.	Sahjahanpur	21,725
	Total: Bareilly Division	85,596
30.	Varanasi	23,328
31.	Jaunpur	28,885
32.	Ghazipur	14,796
33.	Ballia	21,725
	Total Varanasi Division	88,227
34.	Moradabad	28,456
	Total Moradabad Division	28,456
	GRAND TOTAL:	11,38,543

In addition to above large tract of cultivated mild to moderate Usar lands are available in these districts.

ANNEXURE-II

SUBSIDY AVAILABLE AS PER CENTRALLY SPONSORED SCHEME

S.No.	Item of Development	Cost per unit of 4 ha. (Rs.)	Subsidy (Rs.)
1.	Levelling & bunding	6,000	-
2.	Boring	4,800	3,000
3.	Elec. Pumpset, Delivery Tank & Pumphouse	11,500	-
4.	Soil Amendments	17,600	13,200
5.	Application of soil amendments	400	-
6.	Green Manuring	800	800
7.	Crop production cost	21,600	-
	Total:	62,700	17,000

ANNEXURE-III

STATEMENT SHOWING COST OF PRODUCTION AND BENEFITS-4 HA. MODEL PADDY - WHEAT ROTATION

Crops	Yield in Qtls/Ha Ist yr.	2nd yr.	3rd Yr. onward	Area under cultivation	Yield in Qtls. 1st yr.	2nd yr.	3rd & onward	Farm Gate rate per Qtls. (Rs.)	Gross Income from Products (in Rs) 1st yr.	2nd yr.	3rd year onward
Paddy:											
Grain	20	25	30	4.00	80	100	120	150	12000	15000	18000
By product	35	40	45	KHARIF	140	160	180	10	1400	1600	1800
Wheat											
Grain	10	15	18	4.00	40	60	72	160	6400	9600	11520
By Product	15	22	27	RABI	60	88	108	40	2400	3520	4320
							Total		22200	29720	35640

	Total Income (Rs.) 1st Yr.	2nd Yr.	3rd Yr. onward	Cost of Crop Production 1st Yr.	2nd Yr.	3rd Year onward	Net Income (Rs.) 1st	2nd	3rd Year onward
Paddy	13400	16600	19800	10600	10600	10600	2800	6000	9200
Wheat	8800	13120	15840	11000	11000	11000	(-)2200	2120	4840
Total	22200	29720	35640	21600	21600	21600	600	8120	14040

ANNEXURE-IV

CASH FLOW ANALYSIS FOR A 4 HECT. UNIT AREA

YEARS	I	II	III to IX	X	XI - XII
I. Gross Income	22200	29720	35640	36240	35640
II. Total Cost-					
i) Production cost	22400	22400	22400	22400	22400
ii) Intt.on S.T. Loan @ 12%	-	1392	1392	1392	1392
Total	22400	23792	23792	23792	23792
iii. Net Income	-200	5928	11848	12448	11848
iv. L.T.Loan	40300	-	-	-	-
v. Subsidy	16200	-	-	-	-
vi. Net Loan	24100	-	-	-	-
vii. Repayment:					
Principal	-	-	2410	2410	2410
Intt.10%	-	-	1350	1350	1350
viii. Repairs to Old bund	-	-	-	6000*	
ix. Net Surplus	-24300	5928	8088	2088	8088

* Since in the year X farmers economic condition would be better and it would be possible for him to bear this cost.

ANNEXURE-V

BENEFIT AND COST RATIO AND IRR FOR 4 HECT. UNIT

(Figure Rs. in 1000)

Year	Costs	D.F.@ 10%	P.W.@ 10%	Benefits	D.F.@ 10%	P.W.@ 10%
1	62.7	0.91	57.06	38.4	0.91	34.94
2	23.8	0.83	19.75	29.7	0.83	24.65
3-9	23.8	4.02	95.68	35.6	4.02	143.11
10	29.8	0.39	11.62	36.2	0.39	14.12
11-12	23.8	0.67	15.95	35.6	0.67	23.85
			200.06			240.67

$$\text{B.C. Ratio} = \frac{240.67}{200.06} = 1.20$$

Year	Net Benefit	D.F.@ 10%	P.W.@ 10%	D.F.@ 30%	P.W.@ 30%
1	-24.3	0.91	-22.11	0.77	-18.71
2	5.9	0.83	4.90	0.59	3.48
3-9	8.1	4.02	32.56	1.66	13.45
10	6.4	0.39	2.50	0.07	0.45
11-12	11.8	0.67	7.90	0.10	1.18
			25.75		-0.15

$$\text{I.R.R.} = 10 + \frac{20\ (25.75)}{(25.75+0.15)} = 29.88$$

ANNEXURE - VI

Phase Programme

1. Total area to be reclaimed - 12 lakhs hectares
2. Cost of reclamation - Rs. 40,300/- per unit area of 4 hectare
3. Subsidy to be shared by Govt. - Rs. 16,200/- area (40%)
4. Net loan required from World Bank - Rs. 24100/- area (60%)
5. Total amount required from World Bank - Rs. 723 crores.
6. Physical & Financial Phasing to cover entire area:

S.No.	Year	Physical coverage (Lakh: Hect.)	Amount required to be shared by Government	Amount loan fr World B
			(Rs.Lakh)	(Rs. Lak
1.	1987-88	0.75	3037.50	4518.7
2.	1988-89	1.00	4050.00	6025.0
3.	1989-90	1.25	5062.50	7531.2
4.	1990-91	1.75	7087.50	10543.7
5.	1991-92	1.75	7087.50	10543.
6.	1992-93	1.75	7087.50	10543.
7.	1993-94	1.75	7087.50	10543.
8.	1994-95	2.00	8100.00	12050.
		12.00	48600.00	72,300.